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THE CONDOR

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JUVENAL SAW-WHET OWL
Painting by Allan Brooks

THE CONDOR

VOLUME 50 NOVEMBER-DECEMBER, 1948 NUMBER 6

ECOLOGIC RACES OF SONG SPARROWS IN THE SAN FRANCISCO BAY REGION

PART II. GEOGRAPHIC VARIATION

By JOE T. MARSHALL, JR.

This is the second part of a study of variation in the Song Sparrow, *Passerella* (*Melospiza*) *melodia*, in the counties surrounding San Francisco, San Pablo and Suisun bays in west-central California. Within this small area four races are resident; they are more or less isolated spatially from one another, and the area of each presents a distinctive kind of environment either of fresh-water type, brackish marsh or salt marsh. These several "habitats" are equally characteristic of the niche utilized by individuals of the species as a whole, on the mainland at least. The present study is an outgrowth of Joseph Grinnell's interest in the problem and the resulting accumulation at the Museum of Vertebrate Zoology of a large collection of specimens from the bay region.

The previous section of this work (Marshall, 1948) was devoted to a discussion of the different kinds of habitats occupied by Song Sparrows and the distribution of these habitats such that a map was constructed showing the areal arrangement of actual populations of the birds in this area (*loc. cit.*: fig. 42). This map shows that each race is divided into several populations by geographic barriers, and it is to these populations that we now turn in presenting the ensuing information on morphologic variation. They represent the largest units within which no geographic variation can be found, and it is convenient therefore to combine all samples from any one population and present the color and size attributes of each in a form which will make it possible to detect gradients of change in these characters from one population to another and through linear series of populations. Data will also be presented, for coloration at least, from samples taken at various points along the avenues connecting bay marsh races with the upland race. These samples are located on the above-mentioned map by dots. Correlation of changes in gradients with differences in the ecologic situations and with spatial isolation are sought. Presuming that the color and size attributes of the birds are hereditary, we may then discuss possible explanations for the maintenance of the racial characters in the face of interbreeding between the races at their boundaries.

Study skins of resident races from the bay region totaling 2,015 comprise the series of specimens analyzed; these are limited to specimens in postjuvenal plumages, with reliable data on locality and habitat, from the following sources: California Academy of Sciences, Donald R. Dickey Collections, Museum of Vertebrate Zoology (including skins catalogued to November, 1947, 836 of which were collected by myself), Stanford University Natural History Museum, and the personal collection of Emerson A. Stoner. I am indebted to those in charge of these collections for the loan of specimens. I wish also to thank the following persons who collected large series of specimens (now in the Museum of Vertebrate Zoology) for my study: George A. Bartholomew, Jr., Seth B.

Benson, John Chattin, Wade Fox, Jr., Donald V. Hemphill, Malcolm Jollie, Mary R. Koford, William Longhurst, Charles G. Sibley, Ned W. Stone, and Albert Wolfson.

COLOR AND SIZE DIFFERENCES AMONG THE POPULATIONS

Dorsal color.—No color differences correlated with age (postjuvenal plumages only) and sex are found in bay region Song Sparrows, but the skins exhibit great differences in color due to artificial soiling, abrasion of feathers and fading. Specimens collected in *Salicornia* marshes have the greatest amount of feather abrasion because of constant rubbing against the *Salicornia* stems. Accordingly the backs of all the skins were wiped off with cotton soaked in carbon tetrachloride to remove dirt and smudge, and in all comparisons specimens were divided into the following groups: (1) those in fresh fall plumage (August to November, uplands; August to October, salt marshes) collected after 1929; (2) worn plumage since 1929; (3) fresh fall plumage, collected from 1880 to 1929; (4) worn plumage, collected from 1880 to 1929. Within the above groupings, samples from various populations were compared with each other in mass effect, then each specimen was assigned to one of eight arbitrary color categories for purposes of presenting the data in histograms. The color concerned is that which suffuses the entire dorsal surface exclusive of the black shaft spots. These two methods balanced each other in that the former emphasized the uniformity of mass effect of coloration prevailing in a given sample and the latter revealed the individual phenotypic variations.

Standards for the eight equivalent categories of dorsal coloration are named on a geographic basis as follows: *blackish-olive,* the color of 70 per cent of the Napa population, or what remains after removing the lightest and brownest specimens; *blackish-brown,* the color of 70 per cent of the North Suisun sample; *reddish-brown,* the reddest and lightest 70 per cent, lacking light gray edges, of the Marin population; *yellowish-gray,* 70 per cent of the San Francisco Bay population remaining after removing all dark specimens with obvious brown coloration; *yellowish-brown,* the predominating coloration found in the San Leandro population; *reddish-brown* with *conspicuous light gray edges on scapulars and interscapulars,* a common type in the Peninsula population; *dark olive-brown,* all birds which do not fall into any of the above categories which are as dark as any bird from the Napa population, found mostly in the northern part of the bay region; *light olive-brown,* often with gray edges, all birds not falling into one of the first six categories which are lighter than any birds from the Napa population, and which are found mostly in the southern part of the bay region. The results of color analysis for the four groups of age and wear are identical; accordingly the groups are combined by populations and the data presented in figures 48 and 49.

Specimens within any sample (usually ten specimens from a certain time and place) from the major populations are usually very uniform, varying within narrow limits of hue and somewhat wider limits of shade due to the greater visible effect of variation in black pigment. Accordingly it would be possible to represent this variability by a normal curve if the samples were divided into more categories. Within samples from zones of intermediate vegetation along the avenues connecting visibly distinct populations (Guadalupe River, 0.8 mi. SE Alviso; Green Valley Creek, mouth; Napa River, 3.5 mi. S Napa) and in the small Richardson Bay population, specimens fall into two approximately equal, radically different types of coloration as seen in mass effect, and they could be represented by bimodal curves of variability if more color categories were used. These two important considerations should be remembered in examining figures 48 and 49, upon which it was impossible to represent such fine points of variability inasmuch as the collection as a whole contains no two specimens exactly the same in the relative extent

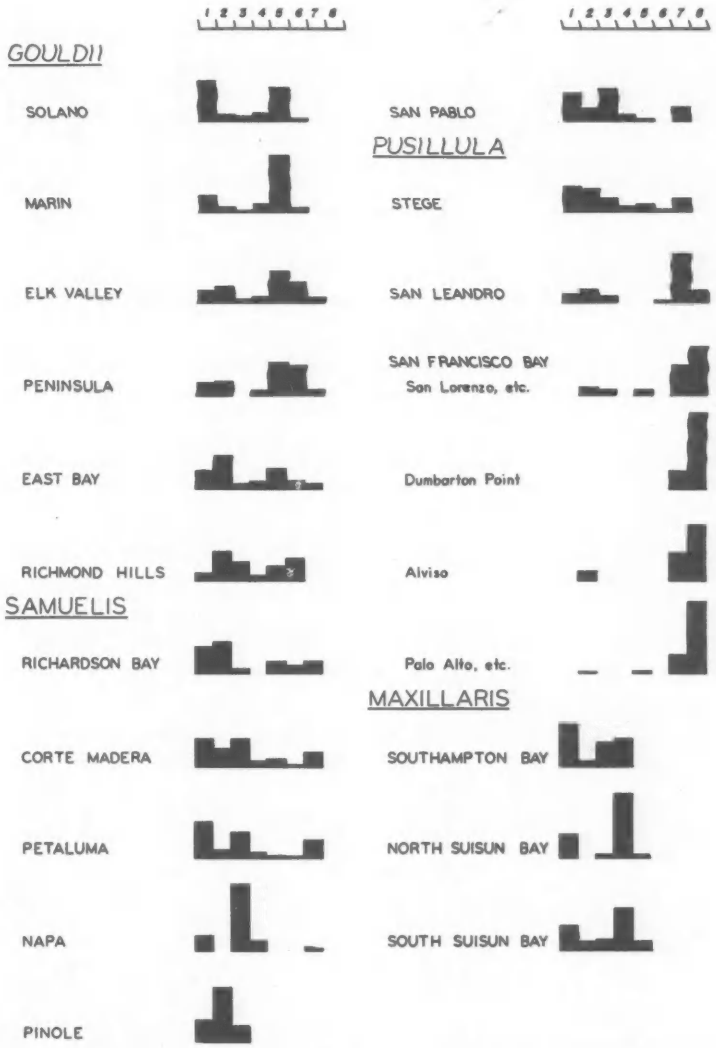

Fig. 48. Geographic variation in dorsal coloration by per cent for the population. Each segment of a histogram represents the same color as those in the same vertical column above and below it. Color categories are numbered as follows: (1) dark olive-brown, (2) light olive-brown, (3) blackish-olive, (4) blackish-brown, (5) reddish-brown, (6) reddish-brown with light gray edges, (7) yellowish-brown, (8) yellowish-gray. The distance from the bottom of one histogram to the bottom of the one just above it is 100 per cent. For number of specimens and habitat represented by each histogram see table 1.

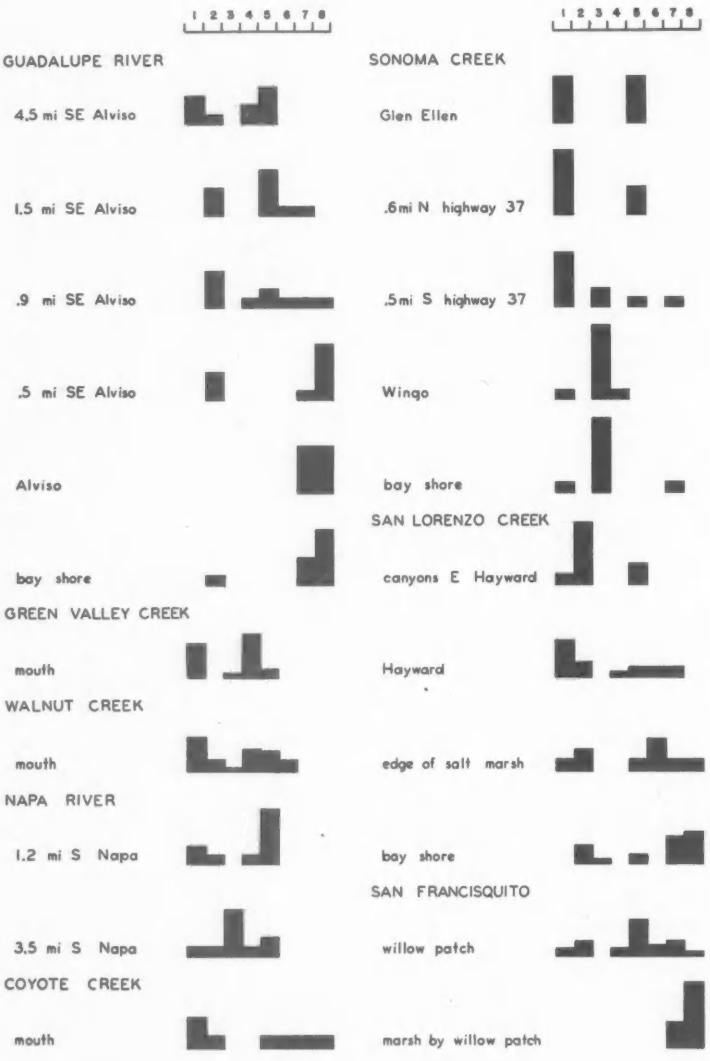

Fig. 49. Geographic variation in dorsal coloration by per cent for samples along the connecting avenues. Orientation and color designations are the same as in figure 48. For number of specimens, exact locality and habitat represented by each histogram, see table 2. Samples along these streams are in order from uplands to bay shore, and have been located by dots on the map of populations (Marshall, 1948: fig. 42).

of the black, yellow and red pigments. The figures do indicate, however, the proportion of specimens from a population which are easily discerned as unique and the proportion of those which are very difficult or impossible to distinguish from the same color category in an adjacent population.

There are four large populations where a color type is present in its extreme development in about 70 per cent of the specimens: reddish-brown (without gray edges) in the Marin population, blackish-olive in the Napa population, yellowish-gray in the San Francisco Bay population and blackish-brown in the North Suisun population. Accordingly we shall let these four populations represent the areas of maximum development of four color races *gouldii, samuelis, pusillula* and *maxillaris,* respectively, and shall extend the boundaries of each race to the half-way point on the gradient of color change connecting any two of these "typical" populations. Thus, the boundary of *gouldii* coincides with the habitat boundary between bay marsh and fresh-water habitats, and the boundaries of the three bay marsh color races with the geographic limits of their respective bays (see Marshall, 1948: fig. 42). The four racial designations are used for convenience in the following discussion; however, they are identifiable with and in area coincide with the subspecies denoted by trinomials in ornithological literature (Grinnell and Miller, 1944:547-551) except that the subspecies *santaecrucis* described from the Peninsula population is here combined with *gouldii* because less than 40 per cent of the birds from its range can be distinguished from typical *gouldii,* and its characteristic of reddish-brown back with light gray edges is an intermediate coloration between *gouldii* to the north and *cooperi* to the south.

Within the range of *gouldii,* there is a smooth gradient of decrease in frequency of the reddish-brown type (number 5, fig. 48), proceeding from the Marin population counterclockwise around the bay region. Reddish-brown is less frequent in the Elk Valley population (which is broadly continuous with Marin) by virtue of interbreeding of *gouldii* with *samuelis* around the edges of Richardson Bay and Corte Madera salt marshes. Thence the gradient jumps the San Pablo Strait to the Richmond Hills and across the Golden Gate to the Peninsula population. From the latter it proceeds to the East Bay population, which possesses the fewest reddish-brown backs. Eastward from Marin, reddish-brown decreases in the Solano population, and here we find the only hiatus in the gradient, namely between Solano and East Bay. These populations are separated not only by considerable distance, the Carquinez Strait and the dry hills on the north side of the strait, but by the interposing of two bay marsh populations between them. Reddish-brown backs occur as rare extreme variants in the three bay marsh races.

Within the range of *samuelis,* blackish-olive backs (number 3, fig. 48) gradually decrease in frequency in both directions away from the typical Napa population, showing no abrupt changes if the populations are spatially isolated, but showing gradual change even if the populations are broadly connected, as Petaluma is with Napa. A few extreme variants, somewhat difficult to recognize as different from the Napa blackish-olive type, occur in the areas of the other three races.

Within *pusillula,* a smooth gradient of decrease in frequency of yellowish-gray (number 8, fig. 48) begins in the part of the marsh from San Bruno to Palo Alto on the west side of San Francisco Bay. To the south, this gradient declines in the vicinity of the two connecting avenues near Alviso, then rises at Dumbarton Point, only to fall again to the northward (on the east side of San Francisco Bay) as more avenues of connection with *gouldii* again enter this vast and entirely continuous marsh population. Not a single example of yellowish-gray is found outside of the *pusillula* populations, but the yellow-

ish-brown type, which represents a mixture of *pusillula, gouldii* and *samuelis* genetic attributes, carries the influence of *pusillula* on into the San Pablo, Richardson Bay and Corte Madera populations of *samuelis* despite some large spatial gaps between them.

The blackish-brown type (number 4, fig. 48) decreases in frequency in all directions from North Suisun Bay (*maxillaris*) and manifests itself in the adjoining range of *gouldii* much more than do the two salt marsh races. There are no blackish-brown examples in the San Francisco Bay population, which is farthest removed spatially from North Suisun. There are two irregularities to be noted in the otherwise smooth gradients for this color type. The first is a hiatus from the north to the south side of Suisun Bay (although they are separated at one point by only 900 yards), with a drop from 69½ per cent to 44½ per cent of blackish-brown backs. (The South Suisun Bay population has a much broader connection with *gouldii* than does North Suisun.) The second is the Southampton Bay population, which falls out of line of the gradient we would expect connecting Napa and North Suisun. Its samples are lighter than either of the latter populations. It is the only completely isolated population in the bay area and is small, containing an estimated 176 pairs of breeding Song Sparrows, based on a count made upon half the marsh.

The four dorsal color categories, dark and light olive-brown, reddish-brown with gray edges and yellowish-brown (numbers 1, 2, 6, 7, fig. 48) represent various intermediate conditions of the four extreme types; they further smooth out the gradients between typical populations of the four color races. The bay marsh and adjacent upland samples approach each other and are practically indistinguishable at the limits of the ranges of *samuelis* and *pusillula* where there is the greatest continuity in habitat from bay marsh to uplands and where the bay marsh populations are also the smallest. That is, the Richardson Bay and Corte Madera populations are practically indistinguishable from Elk Valley, and across the bay, Pinole, San Pablo and Stege are almost indistinguishable from the East Bay and Richmond Hills populations. Also, the South Suisun population is very close to East Bay in dorsal coloration. Accordingly, it is impossible to identify changes in gradient along connecting avenues at these points, where there is greatest ecologic and spatial continuity between bay marsh and adjacent upland populations.

Elsewhere, there is greater spatial separation of the two stocks, which are much more different from each other in color, and we find along the connecting avenues of the Guadalupe River, Sonoma Creek, the Napa River and Green Valley Creek miniature gradients exhibited along the single or double rows of Song Sparrow pairs (fig. 49). These gradients remain fairly uniform as long as the habitat is constant; at the zone of intermediate vegetation at the mouths of these creeks, a half-and-half mixture of bay marsh and upland color types is found, which constitutes an abrupt steepening of the color gradient in the ecologically intermediate zone. This transformation takes place within at most 3 miles on the Napa River, 2 miles on Sonoma Creek and one mile on the Guadalupe River and Green Valley Creek. The only connecting avenue which shows an actual hiatus is the gradient in San Francisquito Creek, where there is an abrupt change in vegetation from tall willows to *Salicornia-Grindelia* marsh without an intermediate zone.

No color difference is noted between the samples at Point Reyes Station (fresh-water marsh) and Tomales Bay (salt marsh) where the salt marsh population is almost entirely continuous with birds living in the soft chaparral, brackish marsh and fresh-water marsh around it.

Ventral coloration.—The character under consideration here is the color of the unspotted portion of the feathers of the ventral surface, which are either all pure white

or all lemon yellow. Specimens were classified into pure white, light yellow, medium, and intense yellow categories but are represented in tables 1 and 2 only as yellow present or yellow absent. There is no sex or age (postjuvenal plumages) variation in this character. The greatest proportion of yellow bellies occurs in two segments of the San Francisco Bay population at Palo Alto and Dumbarton Point (91 and 95 per cent, respectively). Northward into San Pablo Bay this gradient, involving only salt marsh populations, decreases evenly the farther the samples are from these centers, becoming lowest at Napa, Pinole and San Pablo. In the uplands and Suisun Bay, ventral yellow turns up as an occasional variant and can be expected in any sample; generally it is of the palest yellow category. However, there are two bright yellow specimens from the uplands, one at Glen Ellen on Sonoma Creek, another at Lake Herman, Solano County.

Table 1
Ventral Coloration in Selected Populations

Race and habitat	Population	Number of specimens	Per cent yellow
Passerella m. gouldii	Solano	61	3½
(fresh-water)	Marin	273	2½
	Elk Valley	40	5
	Peninsula	135	½
	East Bay	253	3
	Richmond Hills	26	0
Passerella m. samuelis	Richardson Bay	24	25
(salt marsh)	Corte Madera	46	13
	Petaluma	124	21
	Napa	80	10
	Pinole	17	0
	San Pablo	73	2½
Passerella m. pusillula	Stege	51	25
(salt marsh)	San Leandro	74	67½
	San Francisco Bay:		
	San Lorenzo Creek to Patterson Creek	49	71½
	Dumbarton Point	21	95
	Alviso	42	81
	Palo Alto to San Bruno	110	91
Passerella m. maxillaris	Southampton Bay	21	0
(brackish marsh)	North Suisun Bay	181	3
	South Suisun Bay	45	2

The proportion of yellow birds drops abruptly at the intermediate zone between salt marsh and riparian habitat as one progresses up streams flowing into San Francisco Bay. The samples from Guadalupe River happen not to include yellow birds; however, in field observation it is common to see bright yellow birds at least a mile upstream. I have seen them at this distance at San Leandro Creek and the Guadalupe River, and have collected them at Coyote Creek, Santa Clara County.

There is only one pale yellow example out of ten specimens collected on the salt marsh at Tomales Bay. This is no more than is expected in any sample from the Marin population which surrounds Tomales Bay.

Wing.—Geographic variation in wing length of adult males, measured from the bend of the wrist to the tip of the longest primary (not straightened) shows (fig. 50) smooth gradients emanating with a decrement from the North Suisun Bay population and generally preserving an independence of upland from salt marsh populations. In the uplands

Table 2

Ventral Coloration in Populations Along Connecting Avenues

Stream and locality thereon	Habitat	Number of specimens	Per cent yellow
Guadalupe River			
4.5 mi SE Alviso	riparian	10	0
1.5 mi SE Alviso	riparian	10	0
.9 mi SE Alviso	mixed	10	10
.5 mi SE Alviso	salt marsh	10	50
Alviso	salt marsh	12	91½
Bay shore	salt marsh	10	90
Green Valley Creek			
Mouth	riparian	21	0
Walnut Creek			
Mouth	riparian	68	1½
Napa River			
1.2 mi S Napa	riparian	10	0
3.5 mi S Napa	brackish marsh	10	0
Coyote Creek			
Mouth	riparian	15	26½
Sonoma Creek			
Glen Ellen	riparian	10	10
.6 mi N Highway 37	riparian	10	0
.5 mi S Highway 37	brackish marsh	10	20
Wingo	salt marsh	10	10
Bay shore	salt marsh	10	40
San Lorenzo Creek			
Canyons E Hayward	riparian	9	0
Hayward	riparian	17	6
Edge salt marsh	edge of salt marsh	9	11
Bay shore	salt marsh	20	75
San Francisquito Creek			
Willow patch	riparian	26	11½
Marsh by willow patch	salt marsh	28	96½

it is maintained at a high level; in the salt marsh populations of San Francisco and San Pablo bays it remains low except that toward either side of San Pablo Strait it rises and approaches the dimensions of adjacent upland populations.

The only specimens in which age has been determined by skull examination are those collected in fresh fall plumage by Grinnell and by myself. Of these, the presence of a two-layered cranium with little pillars of bone connecting the layers is diagnostic of an adult until the middle of October, when the young begin to have completely two-layered skulls. All these specimens are plainly marked "ad" or "im" on the labels. I have not accepted similar marks on the labels of other collectors as meaning the same thing, except for birds collected by H. S. Swarth and by A. B. Howell. An intensive study of the molt of the above fall specimens revealed that adult wings are distinguishable from all other wings by the presence of a complete fall molt resulting in a new set of primaries which are broad, unabraded and heavily pigmented with black. All other birds, which are young of the year, retain the entire set of juvenal primaries, which are lightly pigmented and much frayed, or replace 4 or 5 outer ones or 2 or 3 inner ones. Only 2 or 3 specimens showed complete replacement. These new postjuvenal feathers look the same as adult feathers of the annual molt, are longer on the average than the juvenal primaries and shorter than adult primaries. Sexual dimorphism in wing length is pronounced, so that

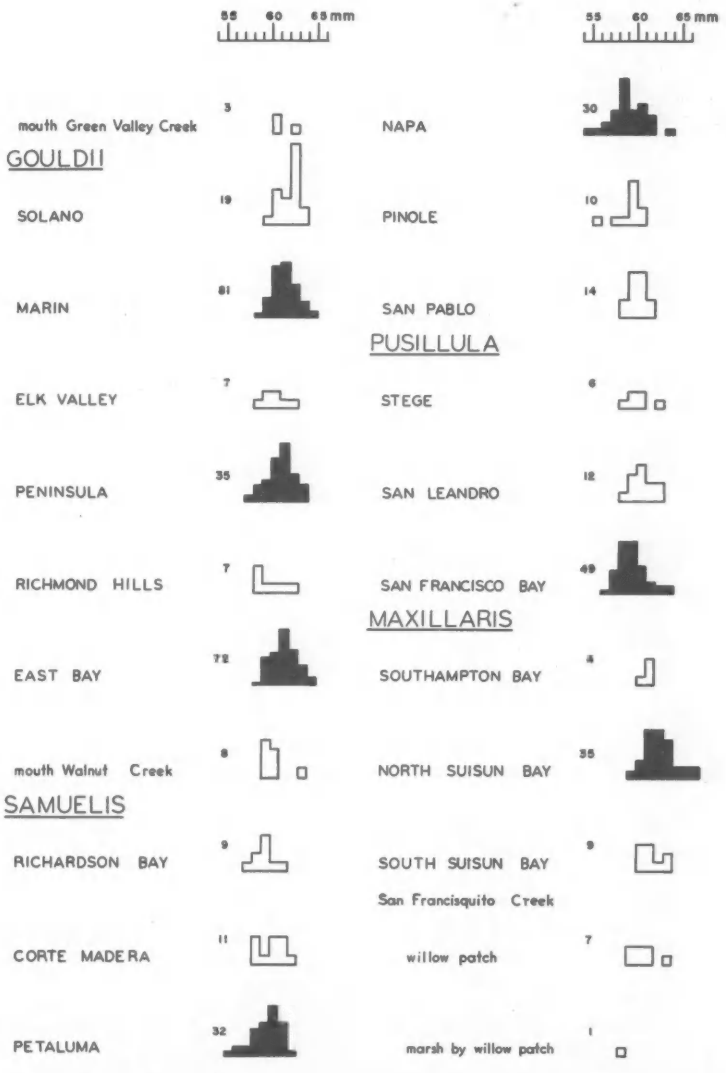

Fig. 50. Geographic variation in wing length by per cent. Populations are named in capitals, connecting avenues in lower-case letters. The distance between the bottom of one histogram and the bottom of the one just above or below it represents 50 per cent. Solid histograms are in per cent. Outlined ones, consisting of series of less than 20 specimens, represent actual specimens, each small square representing one bird. The figures at the side of each histogram refer to the number of specimens.

there are for each population six curves for wing length; those of the juvenal males and adult females coincide.

Table 3 gives the statistical constants for measurements of the four typical populations of the color races. At least the extremes of the gradients for measurements are thus seen to be significantly different from each other. For the few connecting avenues from which enough specimens are available, gradients for change in measurements are more gradual than those for color and involve more than the zone of intermediate habitat.

Table 3

Measurements of Typical Color-race Populations

Measurement and population	Number of specimens	Mean and standard error	Standard deviation
Wing length			
Marin (*gouldii*)	81	61.15 ± .14 mm.	1.30
Napa (*samuelis*)	30	58.77 ± .36	1.98
San Francisco Bay (*pusillula*)	49	59.16 ± .22	1.51
North Suisun (*maxillaris*)	35	62.47 ± .27	1.62
Tarsal length			
Marin	168	21.26 ± .04 mm.	.56
Napa	59	20.30 ± .09	.69
San Francisco Bay	134	20.33 ± .05	.60
North Suisun	116	21.56 ± .05	.58
Bill length			
Marin	265	8.57 ± .02 mm.	.39
Napa	102	9.03 ± .03	.37
San Francisco Bay	206	8.27 ± .03	.36
North Suisun	177	9.35 ± .03	.38
Bill depth			
Marin	230	6.60 ± .02 mm.	.25
Napa	81	6.82 ± .03	,26
San Francisco Bay	191	6.28 ± .02	.25
North Suisun	170	7.81 ± .02	.30
Weight			
Marin	39	19.96 ± .14 gr.	.89
Napa	17	18.79 ± .28	1.19
San Francisco Bay	37	18.60 ± .13	.80
North Suisun	27	20.76 ± .17	.91

Tarsus.—Tarsi were measured from the proximal end of the tibiotarsus (exposed at the lateral surface of the heel) to the distal margin of the last unfurrowed scute or its equivalent on the dorsal surface of the foot. Sexual dimorphism, but not age variation, is exhibited equally by all the populations; accordingly all males are combined for the histograms shown in figure 51. Gradients of decrease in tarsal length emanate from the North Suisun population, but pursue an independent course and at a higher level in the uplands than in the bay salt marshes.

Bill length.—Bill length, measured from the anterior edge of the nostril, shows no discernible difference correlated with sex or age. Geographically, it varies (fig. 52) purely as a function of distance from the North Suisun population, no matter what the habitat. It is greatest at that locality and decreases in an even gradient in all directions to a minimum in the San Francisco Bay and Peninsula populations.

Bill depth.—This measurement is from the highest part of the culmen to a point on the ventral border of the ramus in the same transverse plane. I have cut down inaccuracies (which amount to 0.1 mm.) by measuring as many bills as possible at a single sitting and by remeasuring a dozen or so bills before starting on a new batch. It is the

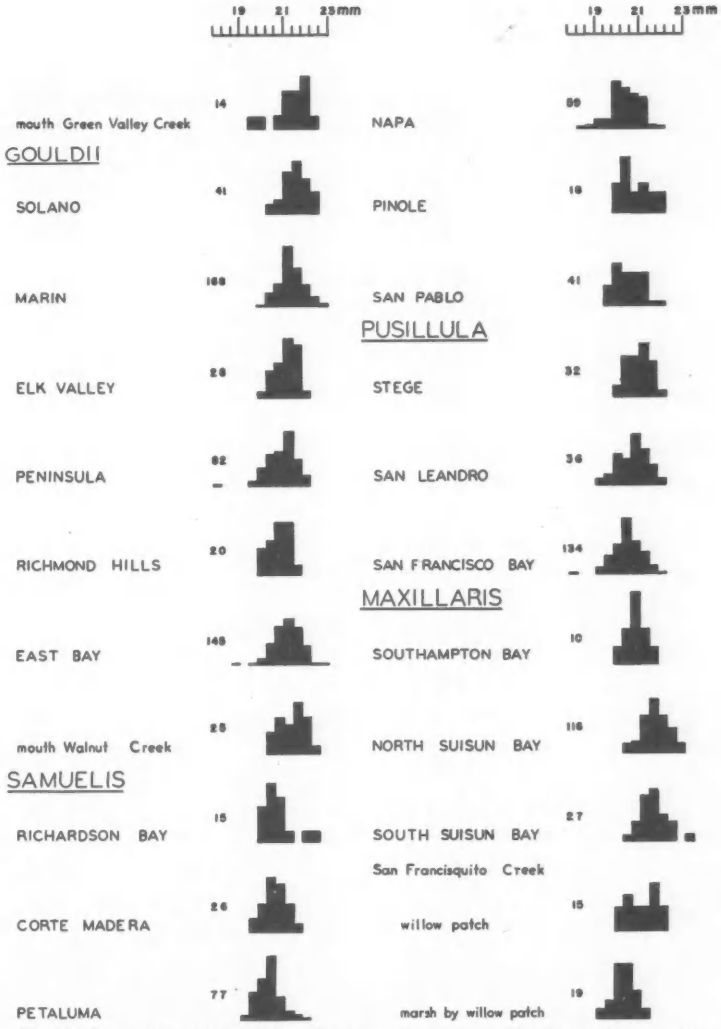

Fig. 51. Geographic variation in length of tarsus by per cent. The distance between the bottom of one histogram and the bottom of the one just above or below it represents 50 per cent. The figures at the side of each histogram refer to the number of specimens.

most revealing geographically variable measurement because of its small individual variation, absence of sexual and age variation, and the tremendous differences among populations. The North Suisun population (fig. 53), with the deepest bill, is 28 per cent greater in this dimension than the San Francisco Bay population, with the slenderest bill. As with the gradient for blackish-brown coloration, so with bill depth, there is a reduction

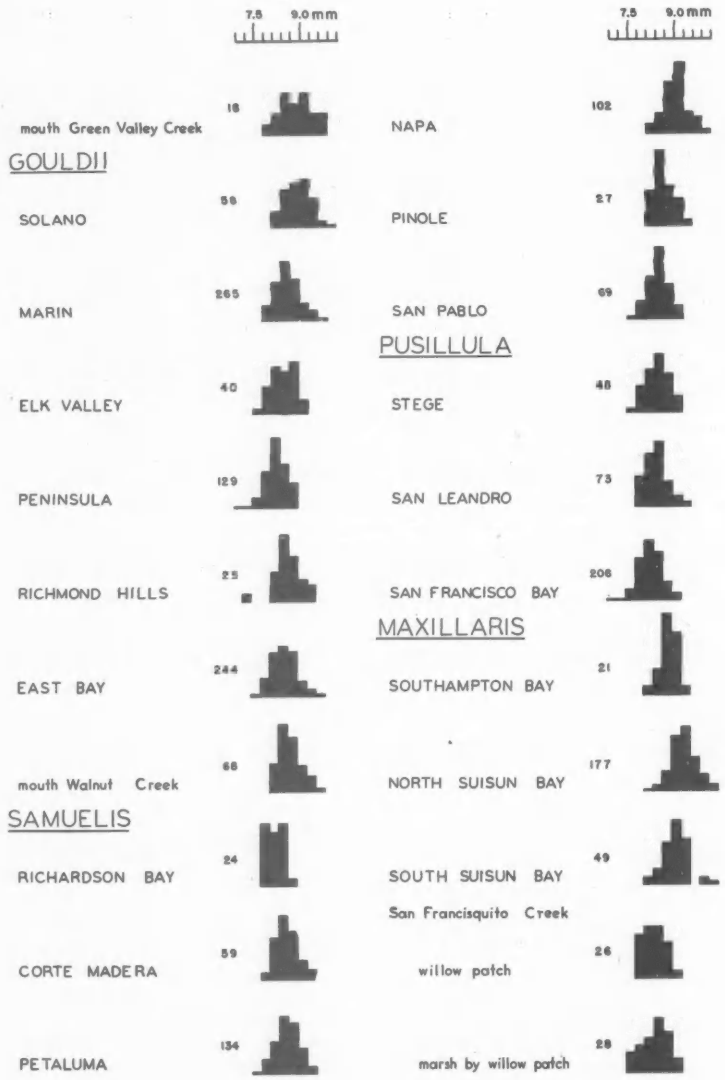

Fig. 52. Geographic variation in length of bill by per cent. Same vertical intervals as in figure 51.

from the maximum at North Suisun to the surrounding South Suisun, Southampton and Solano populations. From these localities the bills become smaller the farther the sample is from North Suisun Bay, but *gouldii* populations surrounding San Francisco Bay do

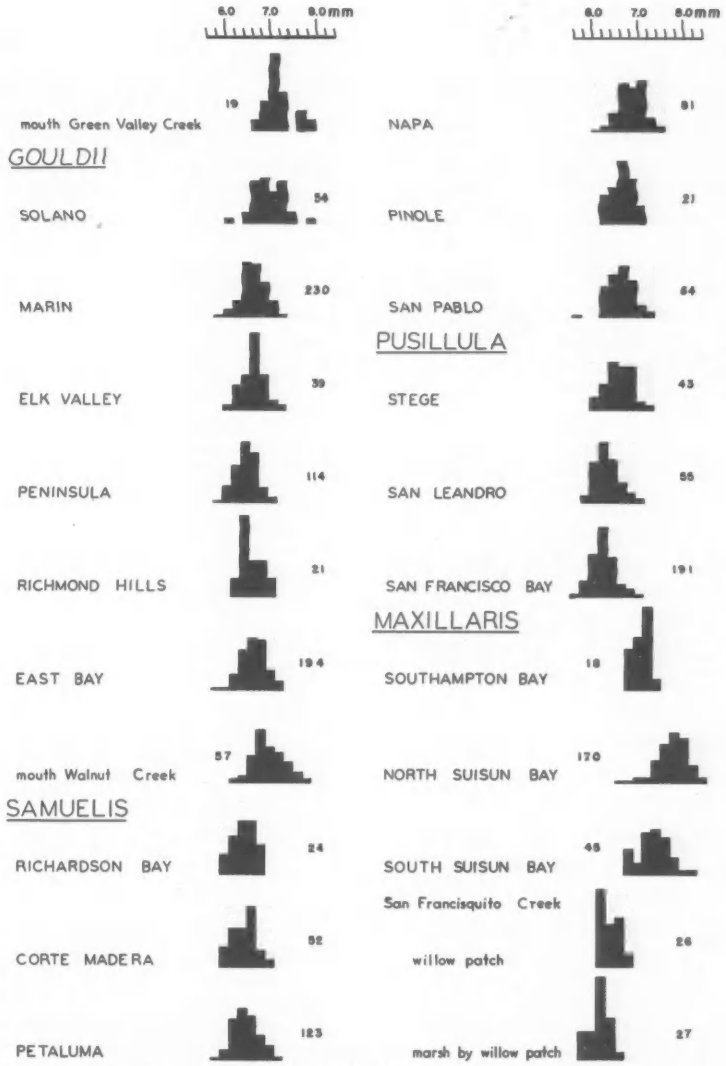

Fig. 53. Geographic variation in depth of bill by per cent. Same vertical intervals as in figure 51.

not keep pace with the decrease noticeable in the San Francisco Bay population, so that these adjacent samples show a significant difference from each other in bill depth.

Weight.—There is sexual dimorphism, but not age variation in weight, which was measured in grams. The males are heavier than the females. Geographic variation is

revealed by a tabulation of weights of 289 recently collected fall males, including only those from the major populations. Table 3 presents the mean, standard error and standard deviation in weight for the four populations typical of the color races. Weight remains constant over the rest of the area occupied by the races; *maxillaris* is heaviest, *samuelis* and *pusillula* lightest and *gouldii* is intermediate. The following intergrading populations are exceptions: Southampton and South Suisun are slightly lighter than North Suisun, and Richardson Bay and Corte Madera are heavier than the rest of the *samuelis* populations. Body weight is correlated by populations rather closely with wing length and particularly the tarsus. The length of the tarsus, for which more examples are available than for weight, is therefore a good indication of the generally body size of birds of a population, but weight and tarsus are not correlated individually as was shown on scatter diagrams which were prepared. The greater constancy of weight than tarsus over populations having the same habitat, reveals the close correlation between this character and the environment. Salt marsh Song Sparrows are smallest in body size, fresh-water birds intermediate, and brackish marsh birds are largest.

DISCUSSION

POSSIBLE GENETIC CONTROL OF CHARACTERS

The coincidence of character and environmental gradients, particularly ventral yellow with salinity, does not necessarily indicate direct environmental determination of the character. I shall assume that these characters are largely determined genetically (Huxley, 1942:185), although experiments are needed to establish this for the Song Sparrow.

The several different dorsal colorations of Song Sparrows in the bay region are the result of different proportions of black, reddish-brown and yellow pigments. The important fact is that no specimen lacks any of these pigments in its feathers. Accordingly there is no qualitative difference between the back colors of different populations, no presence or absence of factors concerned. Taken as a whole, the specimens show every gradation between various conditions of predominance or sparseness of each color or each combination of colors. Individual differences are thus quantitative. Possibly their genetic determination involves many additive factors, cumulative genes as well as alternate alleles. Within a given population with a certain color predominating, the darker birds also are browner and yellower than the rest. Therefore, there may be genetic factors for intensity of general pigmentation as well as others which determine that in a given population one or the other pigments will be minimum or maximum in quantity. There is no discernible correlation in individuals between dorsal coloration and any size character.

Gradations of ventral yellow and the alternate condition of white belly are possibly determined by allelic factors. Yellow belly, if present at all, is usually correlated with yellow dorsal coloration; most of the yellow bellies occur with the yellowish-brown and yellowish-gray back categories. The relationship does not work in reverse, however, as most of the Marin reddish-brown and North Suisun blackish-brown backs have a great deal of yellow pigment which adds to the richness of the prevailing coloration, yet these specimens have pure white bellies. The absence of bright yellow from the Tomales Bay salt marsh specimens, the presence of yellow birds in riparian habitats a mile away from salt marshes (San Leandro Creek, Coyote Creek and Guadalupe River) and the occurrence of yellow variants in more remote uplands (Glen Ellen, Lake Herman) further points to the possibility that the character is hereditary. (These specimens are not wanderers from other populations, as will be shown later.)

Concerning the measurements, it is noteworthy that there is no individual correla-

tion to be found between any two of them. This fact has come to light solely because of the refinement of my statistical data as a result of extensive efforts to determine correctly the age of each specimen. Scatter diagrams of correlation were prepared for all pairs of measurements, including tail length and weight. All apparent positive correlations vanished after the samples were purged of extraneous age groups.

CONSTANCY OF POPULATION CHARACTERS THROUGH TIME

The only instance of change through the years in any population or segment of a population is the appearance since 1940 of a few skins with the head and neck much darker than the back and rump. (One specimen from the East Bay from older collections, M.V.Z. no. 6553, may possess this character, but the skin is so shortened that it is difficult to tell.) Most Song Sparrows from the bay region show conformity of all parts of the dorsal surface (excluding the pure black areas) to a uniform hue and shade, although the relatively more prominent black spots on the crown make the head appear somewhat darker. Twenty-two recent specimens, out of a total of 2,015 both recent and old, have the new character, manifested by a differential increase in the light areas of the scapulars and interscapulars and their suppression on the head, combined with more black pigment on the hindneck than on the rump. Most of these show also a disproportionate increase of chestnut-brown color on the hindneck. The number of these apparent mutants in the samples is as follows: South Suisun 10, Southampton 3, North Suisun 2, East Bay 3, mouth of Walnut Creek 1, Marin 1, Elk Valley 1 and Richardson Bay 1.

Aside from this one very minor change, all series taken in different years from the same place are practically identical, in spite of many interruptions in connecting avenues (see explanation, Marshall, 1948: fig. 42) and obliteration of segments of bay marsh populations due to the activities of man. For instance, a series of 54 old specimens, 47 of them taken in 1916, from the mouth of Walnut Creek average the same in color and measurements as a series of 15 taken there from 1940 to 1942. At the time the earlier collection was made, Walnut Creek joined the South Suisun brackish marsh, in fact there was a large fresh-water marsh (where the specimens were taken) which was continuous both with the riparian and brackish marsh habitats. The recent sample was taken from the last willows at the mouth of Walnut Creek which at the time were separated from the brackish marsh by about two miles, as the fresh-water marsh had been drained and the last two miles of willows had been cut down. (A census in 1947 revealed a continuous connection of Song Sparrows along this avenue, as the willows had grown up again.)

Others examining the collection may wonder at differences in bill length between old and recent samples from the marshes around San Pablo Bay and differences in tarsus and coloration between old and recent samples from the Stege population. The old collections from San Pablo Bay contain many late summer specimens with long bills, which I believe have grown out due to changes in food utilized at that season. There are no specimens from that time of the year in recent collections, but old and recent fall specimens have the normal shorter bill. Concerning Stege, the old collection is from the portion of the marsh at the entrance of the connecting avenue, Cerrito Creek, and shows more characters of *gouldii* than *pusillula*. The recent birds are from a mile to the north. This population is a very narrow one, seldom more than two or three territories wide, and we can expect there miniature gradients similar to those found along connecting avenues.

FACTORS TENDING TO MAINTAIN THE DIFFERENCES AMONG POPULATIONS

Restriction in movements of individual Song Sparrows.—Several items of circumstantial evidence indicate that Song Sparrows here are highly sedentary:

1. Each pair stays within its limited territory during the nesting season. Rarely can they be chased more than 100 yards away from where they are flushed. In particularly violent aggressive behavior, birds may chase each other for more than 100 yards, sometimes out of their habitat, and even perch and sing in grassland at the edge of marshes; in both cases they invariably return to their territorial headquarters.

2. In all seasons, birds collected from riparian habitats within a few hundred yards of salt marshes have no mud on the crown and bill and are in relatively unabraded plumage. Those collected in salt marshes near or far from fresh-water habitats invariably have mud caked on their crown feathers, bill and feet and are in abraded plumage.

3. Specimens collected in a given population, provided it is not an intermediate population where one expects examples similar to an adjacent population, agree with each other in the totality of their variable characters; that is, wherever we find a specimen of coloration similar to some remote population, its measurements, especially bill depth, agree with the population where it was collected. Thus, extreme variants in dorsal color (for instance, two reddish-brown specimens from the Petaluma population, one at Palo Alto salt marsh and another at San Bruno salt marsh) as well as yellow-bellied birds from the uplands are not wanderers from a remote population. There is one exceptional specimen discussed below.

4. A comparison of summer and winter dorsal color types for each population reveals no significant seasonal differences except for the East Bay population. There is no increase of color types characteristic of bay marsh populations among upland populations and *vice versa* in fall and winter.

On the other hand, there is contrary evidence to show that under certain circumstances movements do take place:

1. One specimen agreeing in *both* color and measurements with the South Suisun population was collected by Grinnell at the mouth of San Francisquito Creek, Palo Alto, on January 19, 1901. It is evidently a wanderer 40 miles from home. A single example of the race *cleonensis*, a resident population continuous with Marin, was taken in the bay region at Olema, Marin County, September 17, 1909, a distance of 64 miles from the range of *cleonensis*. Out of 2,015 specimens examined from the bay region, these are the only ones which are definitely wanderers from a remote resident population.

2. In March, 1940, in the course of collecting specimens on a small salt marsh at Stege, Contra Costa County, I apparently frightened all six males off the marsh and found them singing from a barren rock breakwater 300 yards out in the bay!

3. A single specimen, resembling birds at the Richmond Hills, was collected on Red Rock Island 1,500 yards out in the bay by Ward C. Russell. There is no permanent population on the island, although there is soft chaparral there inhabited by several pairs of White-crowned Sparrows.

4. In late summer, adults and juveniles of dense bay marsh populations at Grizzly Island, Solano County, and Gallinas Station, Marin County, forage and even sing 200 yards out in hay fields and eucalyptus groves.

5. With the exception of the geographic barriers separating the North Suisun, South Suisun and Southampton populations from each other, there is in general a remarkable continuity of character gradients across geographic barriers. Particularly the samples on either side of the Golden Gate (Elk Valley and Peninsula), of San Pablo Strait (soft chaparral: Elk Valley and Richmond Hills; salt marsh: San Pablo and Corte Madera) and on either end of Dumbarton Bridge (Palo Alto and Dumbarton Point) resemble each other, indicating that birds may fly across these narrows from time to time.

6. Linsdale (1947:237) reports that Song Sparrows in the upper Carmel Valley, of

the race *cooperi,* continuous with the Peninsula population, are more numerous in summer than in winter.

7. There is a decrease in numbers of reddish-brown and dark olive-brown birds in summer in the East Bay population. Out of the collection of 253 skins, 50 are breeding birds taken from April to July, of which 12 per cent have reddish-brown backs, and 12 per cent have dark olive-brown backs. Of the remaining 203 fall and winter specimens, 23½ per cent are reddish-brown and 21 per cent are dark olive-brown. The Solano population is the logical area from which to expect possible migrants into the East Bay population, not only because it possesses a predominance of these two color categories in about equal numbers, but also because the streams there dry up in the fall. There were no Song Sparrows present in the fall of 1947 in the entire drainages of Green Valley Creek and Suisun Creek, which together compose the entire natural habitat of the Solano population, except that there were birds within the last mile of willows next to the bay marsh on both creeks. On April 18, 1948, Emerson A. Stoner and I retraced our path along these creeks and found pairs established and males singing every 50-60 yards along the entire stretch of suitable riparian habitat. Thus, it seems conclusive that these birds migrate, and it is likely that when they do so, they move only to riparian habitats, mostly in the East Bay. Migration is prevalent in many of the northern and northeastern races of the Song Sparrow; in Ohio, some individuals migrate and some do not (Nice, 1937:29-42). At any rate the impulse to migrate under certain conditions is common throughout the species.

It is evident, therefore, that although certain of the Song Sparrows of the bay region can make long flights or migratory movements, these movements are not into unfamiliar habitats, and that with the exception noted, these birds are remarkably sedentary. Especially, those in bay marshes, where the habitat never dries up, must move very seldom, and if at all, only to an adjacent marsh. Such movements as are made do not tend to break down the differences between bay marsh and upland populations.

Chance fixation of hereditary differences in a small, isolated population.—The only sample of specimens which falls out of line of a character gradient is the one from Southampton Bay marsh, Solano County, which appears to exemplify the role of accidental factors in differentiation (Wright, 1940:167). There are about 176 pairs on this marsh. They are cut off from communication with adjacent bay marsh populations by the steep banks of the north side of Carquinez Strait, which permit no marsh vegetation either east or west of Southampton Bay. They also lack connection with the upland Solano population because this marsh is surrounded by dry grassland on south-facing hills, and no riparian habitat crosses this arid expanse. As noted earlier, bay marsh birds, whose habitat is permanent and not subject to drying, are least likely to move; upland birds which move go only to habitats familiar to them. Therefore, Southampton Bay is the least likely of any population in the bay region to receive genetic influences, carried by wandering birds, from other populations. Conditions there would seem favorable for the accidental loss of genetic attributes and the perpetuation of those retained.

Huxley (1942:200) considers the chance factor in very small populations to be an important one in promoting local differentiation. Lack (1947) recognizes it as an important process promoting differentiation among Galapagos finches. However, the number of birds on the Southampton Bay marsh is greater than is usually regarded as readily permitting chance fixation of genetic factors (Wright, 1940:172). A further complication is the unique habitat at Southampton Bay. The lower half of the marsh is brackish and clothed with *Scirpus*; the upper half has predominantly salt vegetation, *Salicornia* and *Grindelia,* but mixed with a luxuriant array of other plants such as *Juncus* and

Achillea growing high on the slough banks and *Scirpus* in the bottoms of the sloughs. Selective factors may operate, not only within the unique habitat setting as a whole, but also between the birds at opposite ends of the marsh. On the other hand, this ecologic diversity may subdivide the population into small effective breeding units aided by a short distance of establishment of young birds from the nest, and together, these factors, coupled with the isolation of the marsh as a whole, may enhance the "Sewell Wright effect."

Further evidence that the Southampton Bay population is out of line of the gradient for dorsal color is furnished by three series of specimens, too worn for individual color analysis, taken from the Napa population near Sonoma Creek (14 specimens), the Napa population on the east side of the Napa River at Vallejo (14 specimens), and from the North Suisun (only 4 specimens but of same color as the average of all other North Suisun specimens). The Vallejo series is exactly intermediate between the other two, that is, it is uniformly dark olive-brown, much darker and browner than Southampton Bay specimens, although farther removed spatially from North Suisun. (These birds were among those taken by Joseph Grinnell on his bicycle trip around the bay in 1901. Each day he mailed his specimens to Stanford University where Robert E. Snodgrass prepared them as skins.)

Chance fixation within a continuous population.—Miller (1947) regards the chance loss of hereditary attributes as accounting for the differences between samples of California Song Sparrows taken within short distances of each other, because the size of the effective breeding population in this species is small. Using the data of Nice (1937) for banded Song Sparrows in Ohio, he arrives at a figure of about 400 meters for the median distance from the nest at which young birds settle in their first breeding season; consequently he sets the radius of the effective breeding unit at that distance also. It is to be remembered that many of Nice's birds are migratory, and the figure would be lower for Song Sparrows over most of the bay region because they are sedentary. Clearly this results in a slowing down of the spread of genetic characters between segments of the population and makes possible the loss of some characters in any small segment of the population in any one generation. In addition to a small effective breeding population, the distribution of these Song Sparrows is of a pattern exactly equivalent to what Wright (1940:172, 175) postulates as optimal for the expression of chance, non-adaptive change. Not only is their range divided into partly isolated segments, but within these segments (the populations), their distribution is essentially one dimensional, along shore-lines, rivers, etc. Therefore, we should find evidence for chance genetic change in the collection of bay region Song Sparrows. It seems to me that such evidence should consist of samples which fall out of line, more or less, with the prevailing character gradients passing through the populations. Miller (1947:190) appears to have such a criterion when he states that mainland populations of Song Sparrows "also show many local fluctuations of random sort, no two groups from a few miles apart showing evidence of just the same gene frequencies."

I have failed to find, with the exception of the Southampton Bay sample, an instance where, within a continuous population, a sample falls out of line of a character gradient even by as little difference as is shown in color between successive collections along just the riparian portions of the connecting avenues. Where differences in proportions of phenotypes do occur over short distances, they are predictable. For instance, the four segments of the San Francisco Bay population differ in color according to their respective proximity to connecting avenues; the difference between the Marin and Peninsula populations is exactly what is expected from their respective geographic positions in an

overall, even gradient for dorsal coloration extending along the coast of California from *cleonensis* in the north to *cooperi* in the south. We do not find situations like the Big Pines colony of Oregon juncos, where a small isolated group of birds in the center of a rather homogeneous population presents a marked deviation in wing length (Miller, 1941:293-294). It can be argued that the collections, not obtained with the purpose of detecting differences between very small segments of populations, would not reflect such differences if they existed, because any one sample might be taken from several breeding units. On the other hand, the collection is rather unique compared with collections of other species inasmuch as it is composed mostly of series of ten or more specimens taken at the same spot on the same day. Unusual interest has attended the bay area races, and through the years many collectors have taken these large samples. They go to marshes, where sparrows are very abundant, and in an hour they can gather a series within a radius of a couple of hundred yards. The fact remains that these discrete series show remarkable uniformity not only over the years, but over distances within major populations. Almost all of my 836 skins are in series of ten taken the same day within the smallest radius in which it is convenient to collect them. From the Marin population alone I have five such samples of ten birds each in fall plumage, which are very much alike, also four samples from North Suisun and five from East Bay.

Spatial isolation.—It has been indicated that isolation by barriers of open water and unsuitable habitat is probably responsible for the maintenance of differences between the Southampton and adjacent populations, and between Solano and the East Bay. Also it is likely that the distance separating the Napa and San Francisco Bay populations is a decisive factor in preventing their direct admixture. But what of the role of spatial versus ecologic isolation in maintaining the distinctness of the typical populations of *samuelis* and *pusillula* from the upland populations adjacent to them? Stresemann (1943) has emphasized the importance of ecologic factors in differentiation of populations, but he appears to have slighted the role of spatial isolation in so doing. I wholeheartedly agree with Mayr (1942:196) and Lack (1947:131) that although ecologic differences can almost always be found between populations occupying different areas on the earth's surface, yet never can we find a case of differentiation on an infra-specific level definitely unaccompanied by spatial isolation. Without this isolation the Tomales Bay salt marsh birds are identical in morphological attributes with the birds in freshwater habitats surrounding them. Wherever it is lacking between bay marsh and upland populations as at Richardson Bay, Corte Madera and San Pablo, the respective populations become practically indistinguishable.

The San Francisco Bay population offers the most sensitive test of the possible *amount* of isolation (Mayr, 1947:268) sufficient to maintain population differences, because it is so highly differentiated from the adjacent upland birds that small amounts of "gene flow" from the connecting avenues register as visible differences in coloration. Neglecting for the moment the role of natural selection, we see that the presence of a single row of Song Sparrow pairs having *gouldii* coloration along each of the two rivers at the south end of San Francisco Bay and continuing into the salt marsh population at Alviso is sufficient to cause an increase in the intermediate dorsal color type, yellowish-brown, all the way to the bay shore, across four miles of continuous salt marsh. This influence of the upland birds is not enough to swamp out the typical salt marsh characters of the Alviso birds, however. Of course, this analysis breaks down because it is impossible to neglect natural selection in such considerations. At least it is true that in the bay region as a whole there is a direct correlation between magnitude of spatial continuity and similarity of bay marsh populations and respective upland populations,

regardless of their ecologic differences. Perhaps we can also conclude that *at least* the amount of spatial isolation provided now by the arid bayside plain crossed by only a few connecting avenues was necessary for the formation of the races.

Natural selection.—The characters distinguishing the bay area races are certainly not obviously adaptive, nor do gradients of change in several characters align themselves along geographic or ecologic gradients; rather they appear to follow the line of least resistance through zones of maximum breeding continuity in several cases. Nevertheless, it is probable that decisive adaptational advantages accompany the racial characters, at least in the well differentiated populations. What other agency than natural selection can explain the halting of upland characters in the salt marsh populations, after they have penetrated considerable distances beyond the frontiers of the salt marsh races?

Mutation pressure could hardly be great enough to counteract the influx of "foreign" attributes coming not only from the connecting avenues but via the large intergrading populations as well. Only natural selection can account for the restriction of the area of major change in color characters along the connecting avenues to the intermediate habitat zone (Mayr, 1947:268). Huxley (1942:209) states: "Crosses between two harmoniously-stabilized gene-complexes will give relatively disharmonious gene-combinations. The zone of intergradation will constantly be renewed by intercrossing; but it will as constantly be prevented from spreading by selective elimination in favour of the better internal adaptations on either side, even though it may shift its position." Of especial importance is the fact that the zone of intergradation is not half-way along the connecting avenue nor at the portion of the avenue where the population is narrowest or least dense, but precisely at the zone of intermediate habitat. This is nicely demonstrated, for instance, at the Napa River, where the color of *gouldii* is fully established in birds at the first pure fresh-water vegetation. At this point (1.2 mi. S Napa) there is a row of pairs down each side of the river and many more pairs in some adjoining fresh-water marshes; thus, there is broad continuity of the birds with those in the brackish zone. Farther upstream, on the north side of Napa, laurels and oaks appear along the river, and the Song Sparrows are reduced to a very few, widely separated pairs, becoming abundant again farther up the Napa Valley where willows again predominate.

Habitat preference.—We return now to a consideration of the situation at the mouth of San Francisquito Creek, an exception to all the inferences that have been previously made. We seek the actual mode of operation of ecologic isolation at a habitat boundary between two contrasting vegetational growth forms. There was a marked restriction of pairing between birds of the two races at this junction. It is unlikely that preferential mating on the basis of the racial characters was involved, because I have collected and observed in the field many pairs near the mouths of the Guadalupe River, Coyote Creek and San Leandro Creek, both in the salt marshes and in the willows, one member of which was small and yellow-bellied, the other large, brown-backed and white-bellied. Natural selection could not have been so strict that the birds, upon attempting to settle in the foreign habitat, would have disappeared and so have escaped being collected. I would guess that the birds were not used to the habitat across the boundary, did not recognize it as a suitable growth form, avoided it, and so failed to have an opportunity to meet and mate with birds across the boundary. The interposition of a zone of mixed or brackish habitat, as is usual elsewhere around the bay, would have alleviated this difficulty.

Habitat preference, based merely on the impulse of the individual to stay in the kind of environment in which it has been raised and with which it is familiar, may well suffice to answer the questions arising from the unique situation at San Francisquito Creek.

It should be evident that such preference would be unlikely to be fixed genetically, as opposed to the view of Grinnell (1913:194) who regards it as a racial trait, in view of the wide tolerance range of the species as a whole, and particularly, the utilization of salt marshes by such predominantly fresh-water races as *cleonensis*, *gouldii* and *cooperi*. In other words, it is thought that a non-hereditary habitat preference operates *within* the limits of instinctive recognition of the niche for the species (Miller, 1942). The fact that topographic conditions are such as not to favor the long duration of such sharp habitat boundaries makes it impossible to believe that new species could gradually be differentiated under such circumstances in the San Francisco Bay region.

Habitat preference can also account for the absence of even a single specimen out of its habitat in places removed from the immediate vicinity of zones of contiguity. As we have seen, the birds which are principally involved in apparent migratory movements are those from streams which dry up in certain seasons or certain years. This does not include the birds at the mouths of those streams; for instance at Green Valley Creek, there was the same number of birds in the last mile at its mouth both in the spring and fall of 1947, but all had disappeared farther upstream in the fall. Accordingly, those which wander are those with the least chance of becoming familiar with a bay marsh habitat. They apparently move to places of like habitat; this accounts for the lack of mixture of birds in the two opposite habitats on either side of the bayside plain, as the actual distance involved here offers no obstacle to the movements of birds across barriers into familiar habitats.

CONCLUSIONS

The foregoing discussion may have obscured the one important fact that all the various agencies maintaining the racial differences, and probably other agencies not mentioned, are working together to produce the results seen. This is an hypothesis only, but it may be desirable to develop it, not with the aim of disagreeing with the views of other students of this problem, but rather with the intention of seeking an overall explanation for the great amount of racial differentiation exhibited by the Song Sparrows of the San Francisco Bay region. Other writers have stressed the importance of this or that isolating mechanism working in a particular situation.

Let us consider as a starting point the unusual combination of geographic and climatic factors which has produced simultaneously regions of qualitatively different Song Sparrow habitat and regions unfavorable for Song Sparrows separating these same habitats. There is a coincidence here; the areas most different from each other in the kind of environment which they provide for Song Sparrows are at the same time the areas which are the most isolated from each other spatially. It seems feasible to assign to the one factor, spatial isolation, the major responsibility for the racial differentiation. Without the amount of isolation by distance that exists between the various races, it is very unlikely that they could have become differentiated in the first place, let alone maintain those differences.

A further coincidence is worthy of note: those populations which are to the greatest degree differentiated morphologically, namely, the populations typical of the three bay marsh color races, are not only the most isolated populations but are also the largest and densest. By "most isolated" I mean that they have the narrowest and fewest avenues of continuity with adjacent, sparse upland populations of the race *gouldii*. Therefore, even without marked difference in habitat, we might expect these populations to preserve their characteristics if we assume that "gene flow" would be in the direction from dense to sparse populations, providing ecologic diversity were absent. In the absence of this ecologic diversification, we should expect at least some racial differentiation, but the populations would probably fall morphologically into predictable intermediate positions

on clines connecting the race *gouldii* with the race *heermanni* of the San Joaquin Valley. A fairly good illustration of the single influence of spatial isolation is the difference between the races *pusillula* and *samuelis*, both of which live in salt marshes which appear to have no environmental differences.

If we accept spatial isolation as the most important factor, without which the origin of four races within this small area would have been impossible, then surely the presence of ecologic differences among the areas occupied by those races is the next most important factor. This ecologic diversity makes possible a differential between the selective values of hereditary characters in the different races resulting in the selection of different phenotypes in different habitats. It also provides the basis for the awareness and choice of appropriate habitat by the individual bird. This habitat preference together with the sedentary nature of Song Sparrows in the San Francisco Bay region, both tending still further to enhance the effect of spatial isolation, complete the hypothetical picture of the mechanism responsible for the striking racial differentiation exhibited by bay region Song Sparrows.

I have used the word "race" to represent the entities listed usually as "subspecies." I avoid the terms "geographic race" and "ecologic race" because these groups of populations are scarcely more "geographic" than "ecologic." They are in fact nothing but color races definable solely because they contain a population which is the culmination of some color gradient. Because of the lack of correspondence between the various gradients for color and measurements, entirely different races could be designated on the basis of some other character gradient. The presence in the bay region Song Sparrows of these independent, smooth gradients for the various characters, which Huxley (1942) calls "clines," emphasizes the fact that we look in vain for any group of individuals which have the attributes of miniature species. No race possesses stable characters over a fixed area, nowhere is fertility between strains known to be reduced, no population is denied access to at least an occasional source of genetic mixing with its neighbors. If one desires to make the conclusions from this analysis more general, he may state that the San Francisco Bay region Song Sparrows exhibit the same kind of infra-specific variation as do most continental polytypic species. They are perhaps more sedentary than most birds, but that is their only difference.

There are two ways in which populations within a species can evolve under the influence of natural selection the better to adapt themselves to local environments and so the better to adapt the species as a whole to its niche, with the result that it fills that niche in space and time to the limit. Neither necessarily has anything to do with the origin of new species. Either the population can develop the migratory habit and therefore utilize its niche in areas habitable only part of the year, or it can adapt, through innumerable, small genetic changes, to constant sedentary life in the particular sub-niche available. This does not involve pioneering into habitats new for the species, in continental Song Sparrows at least. It involves concentration upon some particular phase of the overall niche of the species. The two processes are to an extent mutually exclusive. The more migratory a species becomes the more are its populations subject to mixture with one another due to irregularities in migration and the less possibility will there be for local differentiation. The more highly adapted a population becomes to its certain sub-niche, the less area does it have available for its most efficient utilization of the habitat, and the more sedentary it becomes. This is climaxed in bay marsh Song Sparrows. In either case, such infra-specific evolution makes the species a "better species," makes it more able to withstand competition from other species, and could just as well be regarded as a program which perpetuates the species as it is, rather than one which leads to new species. To my mind, the pronounced geographic variation shown in local

Song Sparrows is but another example of this nicety of adjustment of the species to its local environments; nowhere do we find a suggestion of the gross differences in habitat preference or the qualitative differences in foraging, song and mating behavior, nor the overlap in distributions which differentiate Song Sparrows from Lincoln Sparrows and Fox Sparrows, the congeners of *Passerella melodia*.

APPENDIX

The distribution of races of Passerella melodia in west-central California.—In addition to the specimens studied in connection with the foregoing account of Song Sparrows in the immediate vicinity of San Francisco, San Pablo and Suisun bays, I have examined all skins catalogued under the subspecific names *gouldii* and *santaecrucis* in the Dickey Collection, all *cleonensis, gouldii* and *santaecrucis* in the California Academy of Sciences, and all specimens from the mainland of the western United States in the collections of the Museum of Vertebrate Zoology. This revealed, among other things, that the subspecific names *santaecrucis* and *mailliardi*, mentioned (the former by a footnote) in the A.O.U. Check-list (A.O.U. Committee, 1931:359) represent populations which possess no unique attributes and are in fact intermediate in all respects between other more strongly differentiated populations continuous with them. (There are some unexplained gaps in the distribution of Song Sparrows in the central valley of California, but the character gradients are nevertheless fairly uniform, at least from Suisun Bay to Fort Tejon, Kern County.) Accordingly, I suggest that the races *santaecrucis* and *mailliardi* be synonymized, respectively, with *gouldii* and *heermanni*; and I present the following synopsis of the distribution of races in or bordering upon the "bay region," patterned after the account by Grinnell and Miller (1944:546-553). All localities mentioned are represented by specimens.

Passerella melodia cleonensis McGregor

Northwest coastal strip of California from Del Norte County south to Gualala, Mendocino County. Record of vagrant: Olema, Marin County, September 17, 1909 (no. 10570 Mus. Vert. Zool.).

Passerella melodia gouldii Baird

Coast districts from Cazadero and the mouth of the Russian River, Sonoma County, south to Pescadero, San Mateo County; in valleys of the inner coast ranges from Laytonville, Mendocino County south to Paicines, San Benito County, but exclusive of bay marshes bordering San Francisco, San Pablo and Suisun bays; ranges from coast inland to Stonyford, Colusa County, Rumsey, Yolo County, Vacaville, Solano County, and Danville, Contra Costa County.

Passerella melodia samuelis (Baird)

Salt marshes along north side of San Francisco and San Pablo bays, from Richardson Bay east to Vallejo, Solano County; also on south side of San Pablo Bay southwest to San Pablo Point on Richmond headland.

Passerella melodia pusillula Ridgway

Salt marshes bordering south arm of San Francisco Bay, from San Francisco (formerly) and San Bruno on the west, south to Alviso, Santa Clara County, and thence north on east side of bay to Stege, Contra Costa County.

Passerella melodia maxillaris Grinnell

Brackish marshes surrounding Suisun Bay; on the north side, in Solano County from Southampton Bay east to Grizzly Island, on south side, in Contra Costa County from Port Costa (formerly) and Martinez east to Pittsburg. Record of vagrant: Palo Alto, Santa Clara County, January 19, 1901 (no. 36009 Mus. Vert. Zool.).

Passerella melodia heermanni Baird

Sacramento-San Joaquin Valley from Colusa County south to Fort Tejon, Kern County, west to Rio Vista, Solano County, Antioch, Contra Costa County, and Los Baños, Merced County.

Passerella melodia cooperi Ridgway

Coast districts from Santa Cruz,. Santa Cruz County, south to northwestern Lower California.

LITERATURE CITED

American Ornithologists' Union Committee
1931. Check-list of North American birds. Fourth edition (Lancaster, Pa., Am. Ornith. Union).

Grinnell, J.
1913. Note on the palustrine faunas of west-central California. Univ. Calif. Publ. Zool., 10: 191-194.

Grinnell, J., and Miller, A. H.
1944. The distribution of the birds of California. Pacific Coast Avif. No. 27.

Huxley, J.
1942. Evolution the modern synthesis (New York and London, Harper and Brothers).

Lack, D.
1947. Darwin's finches (London, Cambridge Univ. Press).

Linsdale, J. M.
1947. A ten-year record of bird occurrence on the Hastings Reservation. Condor, 49:236-241.

Marshall, J. T., Jr.
1948. Ecologic races of song sparrows in the San Francisco Bay region. Part I. Habitat and abundance. Condor, 50:193-215.

Mayr, E.
1942. Systematics and the origin of species (New York, Columbia Univ. Press).
1947. Ecological factors in speciation. Evol., 1:263-288.

Miller, A. H.
1941. Speciation in the avian genus *Junco*. Univ. Calif. Publ. Zool., 44:173-434.
1942. Habitat selection among higher vertebrates and its relation to intraspecific variation. Amer. Nat., 76:25-35.
1947. Panmixia and population size with reference to birds. Evol., 1:186-190.

Nice, M. M.
1937. Studies in the life history of the song sparrow I. Trans. Linn. Soc. N. Y., 4:1-247.

Stresemann, E.
1943. Oekologische Sippen-, Rassen- und Art-unterschiede bei Vögeln. Jour. für Ornith., 91: 305-324.

Wright, S.
1943. The statistical consequences of Mendelian heredity in relation to speciation: In: Huxley, J., The new systematics, pp. 161-183 (Oxford, Clarendon Press).

Museum of Vertebrate Zoology, Berkeley, California, July 1, 1948.

COMMENTS ON ICTERUS CUCULLATUS CUCULLATUS SWAINSON IN THE UNITED STATES

By GEORGE MIKSCH SUTTON

On April 17, 1935, I collected a female Hooded Oriole, *Icterus cucullatus* Swainson, among scattered trees along Maravillas Creek on the Combs ranch, 13 miles south of Marathon, Brewster County, Texas. The bird had not scolded me at all, and, since I did not hear nor see another oriole in the immediate vicinity, I concluded that it was not on its nest-territory. It did not have a brood patch. The ovary measured 5x6 mm., the largest ovum being about 1.5 mm. in diameter. Josselyn Van Tyne and I identified this specimen as *Icterus cucullatus cucullatus* (see Birds of Brewster County, Texas. Misc. Publ. Mus. Zool., Univ. Mich., No. 37, 1937:92).

The only other specimen of Hooded Oriole from Brewster County, Texas, in existence, so far as I know, is a male in first breeding plumage which I collected May 18, 1935, on the Graham Ranch along the Rio Grande a mile west of the village of Boquillas (about 75 miles south of Marathon). The bird was singing brilliantly in cottonwoods not far from the river. Its testes were considerably enlarged and I believe it had established a nest-territory, although I did not, admittedly, see nor hear a female anywhere in the vicinity. Dr. Van Tyne and I felt uncertain about the subspecific identification of this specimen, so we sent it to Harry C. Oberholser, who pronounced it *Icterus cucullatus nelsoni* Ridgway (*ibid.*).

Since the publication of these findings, *Icterus cucullatus cucullatus* has again been recorded in Texas—an adult male collected at Del Rio, in Val Verde County (see Burleigh and Lowery, Auk, 58, 1941:101). This specimen I have not examined, but both Burleigh and Lowery have had considerable experiencee with the nominate race of this oriole in Mexico and I feel sure that their identification was correct.

Since the A.O.U. Committee on Classification and Nomenclature has not listed *Icterus cucullatus cucullatus* in any of its recent supplements to the Check-list of North American Birds, and since female Hooded Orioles are, perhaps, less easy to identify subspecifically than adult males, I deemed it advisable to re-examine the female specimen from Marathon, Texas, referred to above, and to compare it directly with recently collected material from Tamaulipas and Nuevo Leon. W. E. Clyde Todd was good enough to send the specimen (GMS 6067) from the Carnegie Museum; Kenneth C. Parkes sent me all the Hooded Orioles (20 specimens) from the Louis Agassiz Fuertes Memorial Bird Collection at Cornell University; and I assembled all the Hooded Orioles available in Ann Arbor (from the University of Michigan Museum of Zoology, Max Minor Peet, and Sutton collections).

A surprising fact about the extensive series (162 specimens) thus amassed is that there are only 4 female *Icterus cucullatus cucullatus* from Mexico in the lot. As a series, these four birds stand out instantly from females of the races *nelsoni, sennetti, californicus,* and *trochiloides* (there are no female *restrictus* in the series) by reason of the strongly orange tone of the under parts, even the least richly colored of them, a specimen taken June 7, 1939, at Linares, Nuevo Leon (UMMZ 101012) being more orange on the breast and lower throat than the most richly colored female *sennetti.* They are more *orange* in tone below and grayer on the sides than female *igneus* from Yucatan and Campeche, some females of that race having a veiled gray throat-patch occupying about the position of the black throat-patch of the adult male.

The female from Marathon, Texas, is strikingly orange below—richer in general effect than any of the four Mexican females just referred to. The wing-length (83 mm.) and tail-length (88.5 mm.) of this bird further indicate the nominate race, Ridgway's aver-

age for 3 female *cucullatus* being: wing, 81, tail, 87.4; while his average for 5 female *sennetti* is: wing, 79.5, tail, 86.4, and for 4 female *nelsoni*: wing, 81.8, tail, 82 (Birds of North and Middle America, part 2, 1902:288-290). A female *cucullatus* from Monterrey, Nuevo Leon, in my own collection (GMS 8476) measures: wing, 81, tail, 86. A female *cucullatus* from Sabinas, Coahuila, in the Peet collection measures: wing, 81.5, tail, 90.5. The female *cucullatus* from Linares, Nuevo Leon, measures: wing, 78, tail, 81.5. This bird is too orange below and too gray on the flanks for either *sennetti* or *nelsoni* despite its shortness of wing and tail.

I am convinced that *I. c. cucullatus* should be added to the A.O.U. Check-list. How frequently the bird ranges into western Texas is, of course, a question. The taking of the singing subadult male "*nelsoni*" at Boquillas would appear at first glance to prove that the breeding form of the region is *nelsoni*. But this specimen should be compared directly with male *cucullatus* in first breeding plumage. The probability is that two or three races of the Hooded Oriole meet and intermingle in southwestern Texas—*nelsoni* ranging eastward by way of "southwestern New Mexico" (see Florence Merriam Bailey, Birds of New Mexico, 1928:652); *cucullatus* ranging northward through Nuevo Leon and Coahuila; and *sennetti* making its way up the Rio Grande Valley from the Brownsville-Matamoros region.

Although *sennetti* is said to breed in Nuevo Leon and Coahuila (Hellmayr, Cat. Birds Amer., Part X, 1937:149), I have not thus far handled specimens from either of those states which I would call *sennetti*. Nuevo Leon specimens before me (several males and 2 females from Monterrey and Linares) are all *cucullatus*. An interesting lot of 7 specimens in the Peet collection taken at Sabinas, Coahuila, by H. H. Kimball, are clearly *cucullatus*, all of them, especially the female and subadult males, being too richly colored below and too long-winged and long-tailed for that race. The 4 adult males measure: wing, 84-87 (85.5); tail, 88.5 (badly worn)-97 (94). The subadult males measure: wing, 82.5, 85.5; tail, 84.5, 88 (both worn).

As for Tamaulipas birds, those which nest in the northeastern part of the state are *sennetti*, of course; but I suspect that this race ranges well to the south of Brownsville along the coast, perhaps as far as Tampico. An adult male specimen (Cornell University 17611) collected by Louis Agassiz Fuertes along the Rio Tamesi, 35 miles northwest of Tampico, near the village of Paso del Haba, on April 17, 1910, may well have been breeding in that region. On the original label is an outline sketch, drawn in ink by Fuertes himself, of the considerably enlarged testes. The wing of this specimen measures 86 mm., the tail, 91. The bird is slightly more richly colored below than topotypical adult male *sennetti*, but is not nearly so reddish orange in tone as *cucullatus* from Monterrey and Linares, Nuevo Leon, and from the Gomez Farias district of southwestern Tamaulipas. This individual might possibly have been a transient on its way north; but along the Rio Sabinas (roughly 100 miles inland, and at a slightly more northerly latitude from Tampico) my party found the Hooded Oriole paired and nesting as early as April 1, 1941, and by that date the migration of the species apparently had ceased there (Sutton and Pettingill, Auk, 59, 1942:30).

At this writing, it appears to me that the nominate race of *Icterus cucullatus* is an inland form which ranges northward to the south edge of western Texas; and that *sennetti* occurs in Texas only in the Lower Rio Grande Valley, its breeding range otherwise being the coastal plain between Matamoros and Tampico, and northern Tamaulipas, and (possibly) parts of extreme northern Nuevo Leon and Coahuila lying just to the south of the Rio Grande.

Museum of Zoology, University of Michigan, Ann Arbor, Michigan, February 9, 1948.

THE PROBLEMATICAL RELATIONSHIPS OF THE ASIATIC SHOREBIRD LIMNODROMUS SEMIPALMATUS

By FRANK A. PITELKA

In conjunction with a study of variation and distribution in American dowitchers (*Limnodromus*), it was desirable to examine the possible bearing of the Asiatic form now known as *Limnodromus semipalmatus* (Blyth) on the relationships of the American forms. As this species is poorly represented in American collections, I have been able to examine only 35 specimens. But the data from this limited material indicate that the present systematic treatment of *semipalmatus* is open to question, and I should like briefly to review the problem.

It is chiefly the affinity of *Limnodromus semipalmatus* to the American dowitchers which is questioned here. If there is valid basis for this doubt, however, then several more questions at once arise. First, is *semipalmatus* really a member of the Scolopacinae? Second, can it be linked, as suggested beyond, with the godwits (*Limosa*)? Third, if *semipalmatus* proves to be related to the godwits, yet displays some affinities to the American dowitchers, are the latter so definitely members of the Scolopacinae as maintained? And finally, do these considerations have bearing on the problem of subfamilial break-up of the Scolopacidae?

In the Scolopacidae, Witherby, *et al.* (1940:154) recognize six subfamilies, whereas Peters (1934:258*ff.*) recognizes only four and excludes the phalaropes from the Scolopacidae altogether. Lest present-day check-lists and handbooks mislead us on this problem by implying that these subfamilies have more or less equivalent rank, let us refer to Lowe's (1931) original studies of the scolopacids. The picture of subfamilial groupings he presents is that among six main groups four (Tringinae, Eroliinae, Scolopacinae, and Limosinae) are primary ones, and two are secondary ones (Arenariinae derived from Eroliinae, Phalaropinae from Tringinae). After delimiting the first three primary subfamilies and the two secondary ones, Lowe (1931:758) states: "We now come to an assemblage of genera which represent, so to speak, the residue of the Scolopacidae," and (p. 759), "I have decided, after a general study of their anatomy and other characters, to include, provisionally at any rate, all the genera above mentioned under one subfamily, the Limosinae." In other words, this subfamily is not necessarily a monophyletic unit; it is apparently a catch-all and merits study for further elucidation of relationships within the whole family. This should be borne in mind in the comparisons of *Limnodromus semipalmatus* and members of the genus *Limosa* presented beyond.

I shall go a step further and object to the statement of Witherby, *et al.* (1940:155) that "*Limnodromus* is shown [by Lowe] to be unmistakably a snipe." In bill structure and associated features of skull and feeding behavior, the members of this genus may be snipes *or they may merely be snipe-like*. Again I hark back to Lowe, who states (p. 750) that among the Scolopacinae, *Limnodromus* "is not so typical or so specialized as the rest" and that it is the most generalized member of the subfamily. Let us note that he cites (p. 752) a resemblance of *Limnodromus* to "*Erolia* or *Limosa*," and states (p. 754) that "the supra-orbital morphology still retains a godwit-like, tringine, or eroliine impress, rather more noticeable in *L. taczanowskii* [= *semipalmatus*] than in *L. griseus* or *L. scolopaceus*." Lowe's main argument concerning the relationships of *Limnodromus* is based on the position of the quadrate in the skull of *L. scolopaceus*, the member of this genus with much the longest bill relative to skull size. The condition in the skulls of *griseus* and *semipalmatus* has not been described yet.

A few other reasons for placing the genus *Limnodromus* in the Scolopacidae are given briefly by Lowe. Mere reference is made by him (p. 755) to supposedly close resemblance of the downy young of "snipe" (*Capella*?) to those of American dowitchers as described by Bent (1927:118). This evidence he regards as "nearly as convincing" (p. 752) as that provided by skull morphology. [It should be noted that at the time Bent prepared his volume on shorebirds he knew only the downy young of *L. scolopaceus*, and these differ in important degree from those of *L. griseus* (Conover, 1941:378; Pitelka, MS).]

With regard to the adult and juvenal plumages, Lowe (*loc. cit.*) states only that "the young [juvenal?] male's plumage is more snipe-like than the fully adult male's." This statement is not elaborated further or documented. In American dowitchers, including the vagrant "Red-breasted Snipe," *L. griseus*, of Britain (Witherby, *et al.*, 1940: 209), the sexes do not differ in plumage characters; in *semipalmatus* this is true of the juvenal and probably of winter plumages, but at least a tendency toward dimorphism is found in the adult plumage (see beyond). Lowe's added point that "the russet-coloured tips to the tail feathers . . . are so typical of the Snipe" is, of itself, unimportant. He omits any reference to plumage and structural resemblances between the godwits and *semipalmatus*.

One difficulty in using and evaluating Lowe's work lies in the fact that he does not tell the reader precisely what skeletal or preserved material he examined. Only once does he indicate, and then indirectly, that he had any skeletal material at all of *L. semipalmatus*. It is true perhaps that Lowe was interested more in broader groupings than in intra-group relations, yet adequate study of the latter alone can lead to a reasonably conclusive and satisfactory arrangement of these broader groupings. It is also true that in dealing specially with *Limnodromus*, he was concerned to demonstrate that this genus displays, not tringine affinities as maintained by earlier workers, but rather affinities to another group and he concluded that this group was the Scolopacinae. Lowe's only fully supported arguments concern skull structure.

The foregoing discussion thus poses a phylogenetic problem which may be stated broadly as follows: Are the dowitchers "half-way on towards the complete scolopacine specialisation of the Snipes and Woodcocks" (Lowe, 1931:755); or, assuming for the moment that the three species represent a monophyletic group (which they may not), are they possibly an early offshoot of another group, perhaps the Limosinae, displaying some convergent tendencies toward the Scolopacinae? Beyond calling attention to and stating this problem, my objective here is only to provide enough data concerning the species *semipalmatus* to justify the doubt expressed about current views of its relationships.

PLUMAGE PATTERN AND COLOR

The adult winter plumage of *L. semipalmatus* is described by La Touche (1933:368) and by Robinson and Chasen (1936:145), the summer plumage by Baker (1929:210) and Shaw (1936:408). See also figures 54 and 55. Colored illustrations are included in works by David and Oustalet (1877: pl. 121) and Dresser (1909: pl. VII). The important differences between adult plumages of that species and *L. griseus* are summarized in table 1, and they apply also to the first-year plumages.

La Touche's description of the winter plumage is correct except for the fact that the pale rufous feathers scattered on the breast of his reference specimen (an October male seen by me; MCZ 131683) are worn feathers of the preceding nuptial plumage. This fact together with the exceedingly worn and faded remiges and rectrices indicate a protracted molt, perhaps abnormally so in this individual. Shaw's description of the summer plumage is based on the fully adult male. Descriptions of the summer plumage by

various authors differ because of failure to recognize that the first-year breeding plumage is, at least ventrally, a varying combination of winter and summer plumage characters. In the fully developed breeding plumage, the whole of the head, neck and under parts is rust-colored except the chin, which is whitish buff, and the lower belly, which is white. Occasionally the belly is also rust with scattered white or white-margined feathers (examples: FM 80713 ♂, see fig. 55; ASL 333 ♂). In the first-year breeding plumage, the rust varies in extent and occurs mainly on the lower neck and breast, occasionally also on the belly (see HBC 14734). In addition there is varying spotting anteriorly and barring posteriorly over both rust and white areas.

Table 1

Characters Distinguishing Adult Plumages of *L. semipalmatus* and *L. griseus*

	L. semipalmatus	*L. griseus*
Winter plumage—		
Crown	Streaked (feathers brownish-gray with light lateral margins)	Plain (feathers gray with dull brownish-black centers)
Upper back	Streaked (feathers brownish-gray centrally, darkest along shaft, with broad light lateral margins)	Plain (feathers gray with black shaft streaks and faint light margins)
Lower back[1]	Black, feather margins white	White
Primaries[1]	Inner webs of outer 5 primaries with wedge-shaped white area; bases of remaining ones increasingly white inwardly	Innermost primaries only margined with white and with white streak along outer side of shaft
Secondaries[1]	White, irregularly barred or banded with brownish gray	Brownish gray margined broadly with white
Underwing coverts	White, with or without dusky, irregular spots	White with conspicuous V- or U-shaped gray bars
Flanks and under-tail coverts	Brownish-gray bars few, sometimes faint	Gray bars numerous, more or less conspicuous
Summer plumage—		
Venter	Plain; bars present only on flanks and anteriorly in first-year plumage	Spotted extensively (except in inland race)
Dorsum	Streaked (feathers broadly rust-colored laterally, dark brown centrally)	Irregularly barred and streaked (feathers narrowly margined and barred with buff, tipped with light grayish brown which whitens distally)

[1] These contrasting differences also apply to the breeding plumage.

The sum of these characters of the first-year plumage strongly suggests the plumage of *Limosa limosa*, whereas the fully developed male plumage is close to that of *L. lapponica*. (For descriptions of these forms, see Witherby, *et al.*, 1940:158, 164.) The resemblance between *semipalmatus* and *L. lapponica* is especially striking as regards color of head, neck, and under parts; no patterning occurs on these areas. The back and wings of *L. lapponica* are colored and patterned more as in *L. haemastica* (Ridgway, 1919:191), whereas the back pattern of *semipalmatus* is conspicuously unlike that of either of the American dowitchers and among godwits it is approached only by the juvenal plumage of *Limosa lapponica*.

The juvenal plumage of *semipalmatus* (see figs. 54 and 55), so far as known to me, has not been described. The young birds briefly described by Sharpe (1896:401) are apparently first-year birds which have undergone partial spring molt. This appears also to be true of Hartert's (1920:1606) brief description of "Juv." birds. The juvenal plumage of *semipalmatus* is similar to that of *L. griseus* except for the following points.

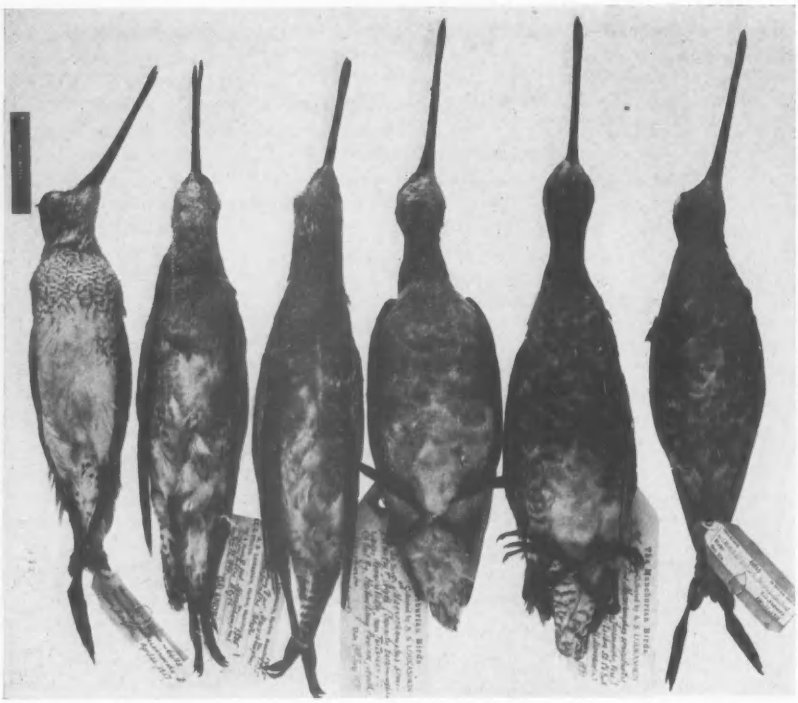

Fig. 54. Plumages of *Limnodromus semipalmatus* shown in ventral view. The specimens, left to right, are as follows: first-year male, winter plumage, Ban Hia, Siam, April 22, 1927 (HBC 6693); juvenal female, Dalai Nor, Manchuria, July 22, 1940 (MCZ 271626); juvenal male, same place and date as preceding (ASL 1535); adult female, breeding plumage, near Tsitsihar, Manchuria, June 9, 1930 (ASL 332); adult male, breeding plumage, same place and date as preceding (ASL 334); adult male, breeding plumage, Ban Hia, Siam, April 22, 1926 (CM 80713).

1. Amount of white on remiges is greater in *semipalmatus*, as noted in table 1 for the winter plumage.

2. The lower back feathers are black margined with white, and not entirely white (see table 1).

3. The dorsal plumage is streaked broadly in consistent manner, not variegated (light, narrow feather margins, submarginal lines, irregular bars) as in *griseus* (see fig. 54 and table 1).

4. Ventrally, recognizing a considerable variability in this plumage, the two forms are similar except that in *semipalmatus* the breast is washed more extensively with buff and the latter color is more vinaceous than in *griseus*. Spotting characters over the entire venter are similar.

Thus, close examination of the juvenal plumages reveals important differences in pattern.

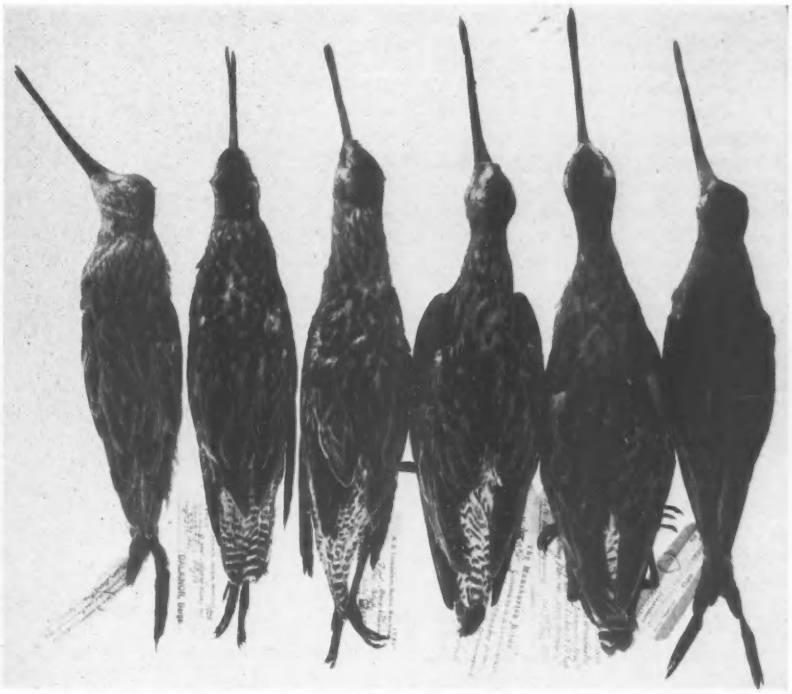

Fig. 55. Plumages of *Limnodromus semipalmatus* shown in dorsal view. Specimens same as in figure 54.

Among the godwits, the juvenal plumage of *semipalmatus* resembles most closely that of *L. lapponica*. Ventrally, they differ in that (1) except for obsolescent marks on the flank feathers, spotting in *lapponica* is confined to the neck and breast and is lighter than in *semipalmatus*, and (2) the buff wash is lighter. Dorsally, the two differ in that (1) the brown coloration is lighter in *lapponica* than in *semipalmatus* (thus, the back pattern is less contrasting), (2) the lower back is less black (thus more white), and (3) the broad lateral buff margins are scalloped more or less along their inner edges, thus breaking the streaked effect conspicuous in *semipalmatus*.

If the resemblance between juvenal plumages of *semipalmatus* and *griseus* is really significant, then attention should also be called to "significant" similarities between the juvenal plumages of *Limnodromus scolopaceus* and *Limosa haemastica*. In this instance, there are again clear-cut differences in pattern, chiefly on the lower back, tail, and posterior under parts. But these need not be described; my only point is that there is just as much basis for statements linking the latter pair of species as for those of Lowe (*loc. cit.*), Brodkorb (1933:127), and others relative to the resemblances of *semipalmatus* to *griseus*.

The plumage of the downy young of *semipalmatus* has been described by Hachlow (1932:290). So far as I can tell from the description and rather poor color reproduction,

the resemblance, in pattern at any rate, to the American dowitchers (Pitelka, MS) is close. In color, the downy young of *semipalmatus* is dark and similar to or darker than that of *Limnodromus scolopaceus*. It is much darker than the downy young of *Limosa lapponica* and *L. limosa* (see Witherby, *et al.*, 1940:159, 165). There are differences of pattern also (see Hachlow, *loc. cit.*). These facts are stressed by taxonomists who place considerable emphasis on evidence of affinities suggested by plumages of downy young and who, on this basis, would link *semipalmatus* with *Limnodromus scolopaceus* and with *Capella*, as exemplified by *C. gallinago*. Evidence from downy young thus does not agree with the main thesis of this paper, but the possibility remains that this evidence has been overemphasized. Clearly, other plumage characters must be considered in phylogenetic postulations together with those of the downy young.

With reference to Lowe's (1931:755) statement concerning the "convincing" similarities of the downy young of *Limnodromus scolopaceus* and snipes, I have compared three downy young of *Capella gallinago* with nine of *Limnodromus scolopaceus* in conjunction with descriptions provided by Witherby, *et al.* (1940:202, 212), where the necessary data are adequately recorded. Here I wish only to call attention to the fact that the two differ to clearly evident degree in patterning on crown, sides of head, chin and throat. Over the remainder of the body, pattern does not differ, while color tones are darker ventrally and richer dorsally in *Capella*. (See also Brooks, 1939:452.) I conclude that resemblances between downy young of *Limnodromus* and those of *Capella* may have phylogenetic significance, or they may not, and that adequate, analytical, and convincing comparisons among downy young of scolopacids have yet to be made, or if made, have yet to be fully presented in print.

EXTERNAL MORPHOLOGY

Turning our attention briefly to structural characters, those of wing and tail form, tarsal scutellation, and development of hind toe attributed by Witherby, *et al.* (1940: 155) to *Limosa* apply also to *Limnodromus semipalmatus* and even to the two American dowitchers. Thus: "Wings long and pointed, first developed primary longest. Tail almost square. Legs long, bare portion of tibia longer than middle toe [at least in *Limosa limosa*, about as long in *Limnodromus semipalmatus*, shorter in American dowitchers]. Tarsus scutellated . . . . Hind toe well developed."

Webbing of the toes in *semipalmatus* (see illustration, Seebohm, 1888:399) is better developed than among members of the genus *Limosa* or the American dowitchers. The webs extend the full length of both inner and outer proximal phalanges. In *Limosa* and the American dowtchers (Ridgway, 1919:177, 182, 196), the web extends along half or more of the proximal phalanx of the outer toe; it is absent or only indicated between the inner and middle toes. In linking *semipalmatus* closely to the American dowitchers, Brodkorb (1933:127) referred to the "web of *semipalmatus* as a good specific character, rather than of generic value," but considered together with characters of plumage color, pattern, and dimorphism (see beyond), this character adds weight to the view that *semipalmatus* is farther removed from the American dowitchers than is now admitted.

Bill characters of *Limosa* and *semipalmatus* are similar except for the facts that the bill in *semipalmatus* is not recurved and the tip of the bill is dilated and pitted, thus snipe-like.

Examination of skins suggests that in *semipalmatus* the ear openings are somewhat lower and more anterior than in the godwits, and thus similar in position to those of the American dowitchers. Skeletal material needed to substantiate this point was not available in the present study.

SIZE

Measurements of *Limnodromus semipalmatus* are given in table 2. These are more extensive than data given by preceding authors. Moreover, the wing measurement (chord) is based only on adult specimens. In the American dowitchers, I find that the wing of first-year birds averages shorter than that of adults because the former carries the juvenal primaries held through the first year until the time of the first complete molt. This difference, while small, becomes important in statistical comparisons of large samples. The average wing dimensions of *semipalmatus* given in table 2, probably because they are those of adults exclusively, are greater than those given by most previous workers. The results presented in table 2, however, must be regarded as provisional not only because of small numbers of specimens, but because there is within the species some suggestion either that variability is greater than indicated by these data or that there is a racial break-up not yet detected. A male specimen (*FM 80713*) not included in table 2, collected by C. J. Aazaard at Ban Hia, Siam, on April 22, 1926, measures 88.3

Table 2

Measurements of *Limnodromus semipalmatus*

		Number of specimens	Range	Mean
Wing[1]	Females	6	168 –181 mm.	174 mm.
	Males	8	164 –172	169
Culmen[2]	Females	9	78.3– 87.1	82.9
	Males	14	74.7– 81.9	80.1
Tarsus[2]	Females	9	47.6– 54.0	50.8
	Males	14	45.8– 52.7	50.7
Weight[3]	Females	5	165 –245 gr.	190 gr.
	Males	3	168 –194	181

[1] Data from adult specimens only.
[2] Data from adult and first-year specimens, the latter collected no earlier than April after the summer of hatching.
[3] Taken from Shaw, 1936:408; a July male collected in Manchuria (MCZ 271625) weighed 160 grams.

mm. in culmen length. It may be a missexed bird, yet it was taken in a season when sexing is not difficult, its plumage is brighter and more extensively rust than that of any other male seen by me, and other dimensions (wing, 171 mm.; tarsus, 51.1) are not extreme, but fall into the overlap between sexes. It may be noted also that Shaw (1936: 408) lists three males with culmen lengths of 81, 83, and 85 whereas none of the 14 other males measured by me has a culmen longer than 82 mm.

But these problems notwithstanding, we can use the data of table 2 for the purpose of general interspecific comparisons. In table 3, measurements from males of two species of *Limosa* and of the American dowitchers are provided. A comparison of these data indicates that among males of these several forms, *semipalmatus* is closest to *Limosa lapponica* in bill and tarsal lengths while it is more or less intermediate between the godwits and dowitchers in wing size. The point I wish to stress here is that there is a clear gap between *semipalmatus* and both the American dowitchers, genus *Limnodromus, sensu stricto*. Again, then, considered with foregoing data, the argument that *semipalmatus* is not closely related to the American dowitchers is furthered. While no skeletal material of *semipalmatus* is available to me, I cannot help noting that head-body proportions in this species, as indicated by a series of skins, are similar to those of *L. lapponica*, and not to those of American dowitchers; that is, the head of *semipalmatus* and the godwits is smaller relative to body than in the American dowitchers.

Size comparisons have been limited to males because of the fact that in the dowitch-

ers (Pitelka, MS), and apparently also in the godwits, degree of sexual dimorphism in dimensional characters is not consistent among species, and the smaller dimensions of males appear to be more useful as bases for interspecific comparisons. This, however, is a matter open to discussion since the problem of differential degrees of sexual dimorphism in certain groups of closely related birds has been little studied. It is one of considerable biological importance.

MOLT AND DIMORPHISM

The material available to me consists of 11 specimens in adult breeding plumage, 8 in first-year (some possibly second-year?) plumage, 12 in juvenal plumage, and 4 in winter plumage. This limited material indicates that sequence of molts and plumages in *semipalmatus* is comparable, in more obvious features at any rate, to that of *Limosa lapponica* and *L. limosa* (Witherby, *et al.*, 1940:158, 164) and also to that of *Limnodromus griseus* (Pitelka, MS). Descriptive data for these latter species may be consulted for the facts. My chief point here is that there is no indication at present that *semipalmatus* differs from either *Limosa* or the American dowitchers, but comparisons based on much larger series should be made.

Table 3

Comparative Measurements of Male Godwits and Dowitchers in Millimeters[1]

	Number of specimens	Range	Mean
Wing			
Limosa limosa limosa	5	198 –225	211
Limosa lapponica baueri	10	218 –235	224
Limnodromus griseus	17	142 –151	146
Limnodromus scolopaceus	20	133 –143	139
Exposed culmen			
Limosa limosa limosa	5	86 –124	103
Limosa lapponica baueri	10	77 – 86	80
Limnodromus griseus	24	51.5– 61.5	56.9
Limnodromus scolopaceus	47	56.8– 68.6	62.1
Tarsus			
Limosa limosa limosa	5	72 – 84	75
Limosa lapponica baueri	10	49 – 53	51
Limnodromus griseus	25	33.4– 40.0	36.7
Limnodromus scolopaceus	47	34.7– 41.2	39.2

[1] Data on *Limosa* are taken from Ridgway (1919:179, 188); data on *Limnodromus* are original and based on Alaskan specimens only.

According to Witherby, *et al.* (1940:159, 165), there is among the godwits a varying tendency toward sexual dimorphism in plumage. In *semipalmatus*, as among the godwits and *not* among the American dowitchers, this tendency is clearly manifest. The fully adult female of *semipalmatus* differs from the male in that rust coloration averages lighter and is not so extensive ventrally; also, the breast may be lightly spotted (see fig. 54). The adult breeding plumage of the female appears to be more variable than that of males and occasional individuals are as richly colored as males (example: HBC 14028). A similarly varying color dimorphism occurs in *Limosa limosa* (Witherby, *loc. cit.*).

DISCUSSION AND CONCLUSIONS

Data presented in foregoing sections, then, are my basis for the introductory statements that *Limnodromus semipalmatus* is doubtfully a close relative of the American dowitchers and also doubtfully a member of the Scolopacinae. I hesitate to isolate *semi-*

palmatus again as the lone member of the genus *Pseudoscolopax* (Blyth, 1859:280), since no satisfactory answer to the question of systematic position of *semipalmatus* can be given at this time. Yet such action would better reflect the present state of knowledge, since the onus of proof would seem to lie with those who regard *semipalmatus* as a member of *Limnodromus*. Some consideration may well be given to Ridgway's (1919:145) suggestive placement of *Pseudoscolopax* with *Limosa* and thus apart from *Limnodromus*, even though his key (p. 146) places them in the same subfamily. In other words, he was concerned here not with just another case of generic splitting, as implied by Brodkorb (1933:127), but with degrees of relationship with the results just cited.

Whether *semipalmatus* should or should not remain in the genus *Limnodromus* can perhaps be answered conclusively by a three-way morphological comparison of this form with *scolopaceus* and Atlantic coast specimens of *L. griseus* representing the smallest race of the latter species. But, as pointed out earlier, we are faced not only by the question of the relationships of *semipalmatus* to other scolopacids, but also by the fact that the present subfamilial subdivision of the Scolopacidae needs to be reexamined. It is obvious that in this comparatively old group of birds, as in the ducks and others, what is most badly needed is information on comparative ethology. At the same time, a comprehensive comparative study of the plumages, molt sequences, and morphological characters would provide clues as to the species on which ethological data would prove most critical.

Information available now suggests strongly the possibility that *Limnodromus semipalmatus* may be a relict form. This suggestion comes not only from the morphological data, but also from the fact of its interior Asiatic breeding range (Lowe, 1931:757). A number of authors dealing with different geographic sections of the Asiatic avifauna have commented on its relative scarcity among the shorebirds of that region.

The problem presented by *L. semipalmatus* is put in a nutshell by its vernacular name, "Snipe-billed Godwit." Long ago, Swinhoe (1863:313) said, "You have only to cut off the bill, and it is almost undistinguishable from *Limosa uropygialis* [= *lapponica*]." The resemblance has been noted also by more recent authors. Appropriate at this point are the comments made by Lowe (1931:720) relative to pattern resemblances in conjunction with the arrangement of genera in the subfamily Tringinae:

"I have already called attention . . . to the great value which . . . colour-pattern schemes have in enabling us to appreciate the relationship which may or may not exist in regard to the members of any given assemblage of 'Waders,' to say nothing of other avian groups . . . . They actually seem to indicate far more important and 'deep-seated' genetic factors than the usual generic characters . . . with which the more evanescent factor of habit is more probably associated . . . . Yet in many of the leading and important works which have professed to classify the members of the Scolopacidae. such truly genetic linkage factors have been entirely overlooked or ignored . . . ." Had Lowe applied these ideas fully in his study of *semipalmatus*, he could hardly have been so definite as he was in his views concerning its relationships.

One more consideration remains. Robinson and Chasen (1936:145) and Delacour (1947:87) regard *L. semipalmatus* as a race of *L. griseus*. It should be clear from the foregoing data and discussions that there is no basis at all for this action.

DISTRIBUTION

The easternmost part of the breeding range of *L. semipalmatus* described by Peters (1934:273) is central Mongolia. It is possible to extend the known distribution eastward on the basis of specimens examined in this study. Three of these specimens were

taken by A. S. Loukashkin near Tsitsihar in the Heilunkiang Province, in central Manchuria.

A list of specimens examined follows. Places of deposit of all specimens are indicated. Since the distribution of *L. semipalmatus* is only sketchily known, locality data and dates of occurrence are given as precisely as possible. Breeding specimens were examined from three Siberian and three Manchurian localities.

Specimens examined.—Total, 35. MALAY PENINSULA: *Bintang I.*—Pulo Adang (Dec. 15), 1 (US). CHINA: *Fukien*—Foochow (Oct.), 2 (MCZ); *Chihli*—Peitaiho (Aug. 14-18), 2 (HBC). MANCHURIA: *Barga District*—Lake Dalai Nor [? = Hulun Nor] (June 3–July 30), 14 (3 FM, 8 HBC, 1 ASL, 2 MCZ); Lamagure Lamasery on Urshun R. (June 8–July 22), 6 (ASL); *Heilunkiang Province*—Nonniho Valley, near Tsitsihar Station, Ch. East Ry. (June 9), 3 (ASL). SIAM: Ban Hia (April 22-26), 3 (2 FM, 1 HBC); Lacon Pen. (Aug. 30), 1 (MCZ). SIBERIA: Argun, Dauria [in Transbaikalia] (June 1), 1 (US); Kirghizland [Southwest Siberia] (June 21), 1 (MCZ); Tchutznog's Lake [Southwest Siberia] (June 7), 1 (MCZ). [US, United States National Museum; ASL, A. S. Loukashkin Collection; CM, Chicago Natural History Museum; HBC, H. B. Conover Collection; MCZ, Museum of Comparative Zoology.]

SUMMARY

The relationships of the Asiatic shorebird now known as *Limnodromus semipalmatus* to the American dowitchers (*Limnodromus griseus* and *L. scolopaceus*) and to the subfamily Scolopacinae are questioned. Data on plumage pattern and color, sexual dimorphism, external morphology and size considered together suggest relationships to the Limosinae, or at least to *Limosa lapponica* and *L. limosa*, should the latter subfamily prove to be polyphyletic. These and other facts indicate that *semipalmatus* may be a relict species meriting close study. Placement of *semipalmatus* in the monotypic genus *Pseudoscolopax* Blyth would better reflect present knowledge concerning its relationships. The known distribution of *semipalmatus* is extended eastward to central Manchuria.

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LITERATURE CITED

Baker, E. C. S.
1929. The fauna of British India . . . Birds. 2nd ed., vol. 6. London (Taylor and Francis).

Bent, A. C.
1927. Life histories of North American shore birds. U. S. Nat. Mus. Bull. 142.

Blyth, E.
1859. Report of Curator, Zoological Department, for February to May meetings, 1859. Jour. Asiatic Soc. Bengal, 28:271-298.

Brodkorb, P.
1933. Remarks on the genus *Limnodromus* Wied. Proc. Biol. Soc. Wash., 46:123-128.

Brooks, A.
1939. The downy young of some Nearctic limicolines. Ibis, 1939:450-453.

Conover, H. B.
1941. A study of the dowitchers. Auk, 58:376-380.

David, A., and Oustalet, M. E.
1877. Les oiseaux de la Chine. 2 vols. (See plate 121.) Paris (Libraire de l'Academie de Medecine).

Delacour, J.
1947. Birds of Malaysia. New York (The Macmillan Co.).

Dresser, H. E.
1909. On the occurrence of *Pseudoscolopax taczanowskii* in western Siberia. Ibis, 1909:418-421.
Hachlow, V.
1932. *Limnodromus semipalmatus* Blyth en Siberie occidentale. L'Oiseau et La Rev. Franc. d'Orn., 2:283-291.
Hartert, E.
1912-1921. Die Vögel der Paläarktischen Fauna. Vol. 2. Berlin (R. Friedländer und Sohn).
Hume, A. O., and Marshall, C. H. T.
1881. The game birds of India, Burmah, and Ceylon. Vol. 3. Calcutta (Hume and Marshall).
La Touche, J. D. D.
1931-1934. A handbook of the birds of eastern China. Vol. 2. London (Taylor and Francis).
Lowe, P. R.
1931. An anatomical review of the "waders" (*Telmatomorphae*) with special reference to the families, sub-families, and genera within the suborders *Limicolae, Grui-limicolae,* and *Lari-limicolae*. Ibis, 1931:712-771.
Peters, J. L.
1934. Check-list of birds of the world. Vol. 2. Cambridge (Harvard Univ. Press).
Ridgway, R.
1919. The birds of North and Middle America, part VIII. Washington (Government Printing Office).
Robinson, H. C., and Chasen, F. N.
1936. The birds of the Malay Peninsula. Vol. 3. London (H. F. and G. Witherby Ltd.).
Seebohm, H.
1888. The geographical distribution of the family Charadriidae, . . . London (Henry Southern and Co.).
Sharpe, R. B.
1896. Catalogue of the birds in the British Museum. Vol. 24. London (British Museum).
Shaw, T. H.
1936. The birds of Hopei Province. Zool. Sinica, 15 (fasc. 1):xxxiv + 528 pp.
Swinhoe, R.
1863. Catalogue of the birds of China . . . . Proc. Zool. Soc. London, 1863:259-339.
Witherby, H. F., Jourdain, F. C. R., Ticehurst, N. F., and Tucker, B. W.
1940. The handbook of British birds. Vol. 4. London (H. F. and G. Witherby Ltd.).

Museum of Vertebrate Zoology, Berkeley, California, February 5, 1948.

ARIZONA WOODPECKER, *DENDROCOPOS ARIZONAE*
A Sketch by Allan Brooks

FROM FIELD AND STUDY

Russian-banded Emperor Goose Killed in California.—On November 24, 1940, while stationed at Sacramento, California, I received from Mr. J. M. Williams of Gridley a band taken from a goose. The bird was killed six miles west of Gridley on November 21 and was described as a whitish goose "with sort of cream-colored spots on him," without black wing tips, weighing about five pounds, and unlike any other goose the hunter had ever seen. The notation on the band was: "510 H—Moskwa—13152 B."

Immediate efforts were made to trace the band, but since just about then Germany and Russia went to war, no reply was received. No further effort was made until late in 1946, when the central office of the Fish and Wildlife Service made further inquiries. Early in 1947 a reply from Mr. A. Tugarinov, Chief of the Ornithological Section, Zoological Institute of the Academy of Sciences, U.S.S.R., carried the following information. The band was one of a series issued to Captain G. Grinberg in 1938 and 1939 when he was working in the vicinity of Uellen (Welen), Tchuktchen (Chukche) Peninsula. Captain Grinberg was killed during the war and all of his papers were lost.

Mr. Tugarinov stated that "as far as I know, the only species of goose breeding in the vicinity of Uellen is *Philacte canagica*. Hence, most probably, it was that species that has been obtained in California." Combining this statement with the fact that the goose was unlike any other Mr. Williams had ever seen and that the Emperor Goose is so rare in the Sacramento Valley that few people there have ever seen one, there seems to be little doubt as to the identity and origin of the goose killed.—JOHNSON A. NEFF, *United States Fish and Wildlife Service, Denver, Colorado, September 30, 1948.*

Nesting Birds of the Ajo Mountains Region, Arizona.—The bird life of the Ajo Mountains of western Pima County, Arizona, remains poorly known. Huey and his assistants collected along their western side, entering lower Alamo Canyon in March, early May, and December, 1939; Huey is the only ornithologist who has written anything about this range. Unfortunately we cannot agree with him that the occurrence of "two or more species of oak trees" in Alamo Canyon "marks the only tendency in the [Organ Pipe Cactus National] Monument towards Upper Sonoran zonal conditions" (Trans. San Diego Soc. Nat. Hist., 9, 1942:358). We found only a single species of oak tree (identified by Dr. C. H. Muller as *Quercus turbinella*, although its appearance is most unusual); but junipers (*Juniperus monosperma*) and Arizona rosewood (*Vauquelinia californica*) are also common in upper Alamo Canyon. Hackberries (*Celtis laevigata* var. *reticulata*) and mulberries (*Morus microphylla*) also grow in the canyon, although most of the mulberries are small. Other Upper Sonoran plants present are hop tree (*Ptelea angustifolia*) and holly-leafed buckthorn (*Rhamnus crocea* var. *ilicifolia*). For plant identifications, we are indebted to Dr. Robert A. Darrow of the University of Arizona.

At the very tops of the ridges (about 4500 feet altitude), the north-facing slopes are more nearly dilute Upper Sonoran than Lower Sonoran. Here are found bear grass (*Nolina microcarpa*), various true grasses, and a patch of true scrub oak. South-facing slopes are purely Lower Sonoran, as saguaros grow to their tops. Leafy trees are everywhere restricted to canyon bottoms and sheltered north-facing slopes.

On March 23, 1947, Phillips visited Alamo Canyon with A. J. van Rossem. Hiking up the canyon, he heard a song which he attributed to a Rufous-crowned Sparrow, but he failed to obtain the bird. Curious to know if birds of the Upper Sonoran Zone breed so far west in southern Arizona, we made camp at the mouth of Alamo Canyon on May 20, 1947. Next day we hiked up and across the canyon to the top of the ridge to the south, and on May 22 we left the region. We are indebted to William R. Supernaugh, superintendent of the Organ Pipe Cactus National Monument, for numerous courtesies, and to A. J. van Rossem for the loan of a series of *Aimophila ruficeps rupicola*.

Falco peregrinus. Duck Hawk. Although a pair of falcons was always much in evidence about a conspicuous cliff south of camp, it was not until our last day there that we were able to identify them as Duck Hawks. They had apparently replaced the Prairie Falcons (*Falco mexicanus*) reported by Huey in 1939. We saw none of the latter species.

Aëronautes saxatalis. White-throated Swift. A total of 16 or more was seen, and a pair was observed mating. There would thus seem to be little doubt of the species nesting here, although it is

rare or local as a breeding bird in the general region (see Sutton and Phillips, Condor, 44, 1942:60).

Salpinctes obsoletus. Rock Wren. Ten birds seen, one pair of which was accompanied by full-grown young, establish the breeding of this wren.

Polioptila caerulea. Blue-gray Gnatcatcher. Rather common, not only on the ridges, but down almost to the very mouth of Alamo Canyon, where one was taken near the windmill and corral. A family of young, not long out of the nest, was encountered a little farther up the canyon, but still in Lower Sonoran Zone surroundings. We saw a total of seven pairs.

Phainopepla nitens. Phainopepla. Although "abundant" and breeding earlier in the spring (Huey), these birds had largely left by late May. We saw but few (total three to five individuals), and these mostly on our first day in camp.

Aimophila ruficeps. Rufous-crowned Sparrow. We found at least a dozen singing males and four or five females, all well up in the mountains. This, with the Blue-gray Gnatcatcher, was the only definite Upper Sonoran Zone indicator species of bird that we noted.

Three males collected on our trip, with seven specimens collected by Phillips and E. R. Tinkham in late October, 1947, show that the birds of the Ajo Mountains are darker both above and below than *A. r. scottii.* Although their bills average larger, they are otherwise identical with *A. r. rupicola* van Rossem (Auk, 63, 1946:562) of the Harquahala Mountains, from which the Ajos are separated by some 125 miles of low, hot desert. This is particularly interesting in view of van Rossem's finding that the birds of the Baboquivari Mountains (only 60 miles east of the Ajos) are slightly paler than typical *scottii.* Our one June male from the Baboquívaris appears darker than average *scottii,* but is probably not representative of its population.

Amphispiza bilineata. Black-throated Sparrow. By no means common; a single bird was heard singing at camp. They were more numerous, but wild, near San Simon, a little farther northeast. A pair taken here, like three birds taken by Tinkham and Phillips on the hillside above the mouth of Alamo Canyon, October 21, 1947, are more purely (grayer) brown on the back, less reddish brown, than *A. b. deserticola,* which Huey found in winter at Bates Well to the west. Curiously, the birds of the Ajo Mountains and San Simon do not appear separable from *A. b. confinis* of the north Mexican plateau, although they occur far to the west of that region and apparently are completely isolated from other populations of *confinis.* Even more puzzling is the fact that several specimens from near Ventana Ranch are good *deserticola,* including one from seven miles south-southwest of Ventana Ranch. This last locality is less than 15 miles, air-line, north of where our San Simon pair was taken, and with no apparent barrier intervening! Our only conclusion is that much remains to be learned about these sparrows in southwestern Arizona.

It seems worth recording that the Arkansas Kingbird (*Tyrannus verticalis*), Mockingbird (*Mimus polyglottos*), Lucy Warbler (*Vermivora luciae*), Spotted Towhee (*Pipilo maculatus*), and Chipping and Black-chinned Sparrows (*Spizella passerina* and *S. atrogularis*) were not found in the Ajos on our trip.

Most of the transients seen were of common species. On May 20, while Phillips was making camp just after our arrival, he was surprised to see a Ground Dove (*Columbigallina passerina*) fly through, very low, going west out of the canyon. An Olive-sided Flycatcher (*Nuttallornis borealis*) was seen on May 21 a little above the mouth of Alamo Canyon. The same day, in the upper part of the canyon, we found a flock of about eight Pine Siskins (*Spinus pinus*) feeding in the composite shrubbery just above the canyon bottoms. A young Green-backed Goldfinch (*S. psaltria*) was taken from this flock. Siskins were also heard twice at camp on May 22.—ALLAN R. PHILLIPS, *Tucson, Arizona,* and WARREN M. PULICH, *Phoenix, Arizona, July 1, 1948.*

Attempted Coition of Rock Dove with Mallard.—Covel's observations of a female California Quail (*Lophortyx californica*) courting certain male Mallards (*Anas platyrhynchos*) at Lakeside Park, Oakland, California (Condor, 50, 1948:165), has prompted the following note: During the month of February, 1948, Mr. Walter H. Boyce of the Westchester County Park Commission and I observed a Rock Dove (*Columba livia*), obviously a male, actively courting certain female Mallards by the Bronx River in Scarsdale, New York. The Rock Dove strutted and cooed in typical courtship fashion, even pecking at the Mallard drakes. The female duck being courted paid no attention to the courtship antics other than to move out of the way when the dove became too excited, whereupon he would divert his attentions to another female Mallard. Many times the dove mounted a female Mallard

in an attempt to copulate, and when this occurred, the duck in question would either fly a short way to rid herself of the dove or enter the water for the same purpose. None of the male Mallards bothered the dove at any time.

At this same location, a winter feeding area, there were usually three Wood Ducks (*Aix sponsa*), two females and one male. The dove completely ignored these female ducks, even when there were no female Mallards in the immediate vicinity. The Rock Dove was the only individual of his species in the area. Perhaps this was the reason for the dove's mis-matched mating attempts, although I can offer no opinion why he ignored the female Wood Ducks.—JOHN L. WOLFF, *Linnaean Society of New York, New York, N. Y., July 31, 1948.*

Songs of the Brown Towhee Evoked by Nest Robbing by Scrub Jays.—About noon on June 6, 1948, hearing a harsh, high-pitched note in the backyard of my home in Berkeley, California, I went out to find four Brown Towhees (*Pipilo fuscus*), presumably two pairs, fighting with two Scrub Jays (*Aphelocoma coerulescens*). Each pair of towhees attacked the jays, fluttering wide-spread wings and tails and uttering this harsh note. They then dropped to the ground a few feet away from where I stood, showing no fear of me. In their excitement the resident towhees intermittently attacked the other pair of towhees in what I took to be a defense of territory. One jay was driven off, but the second, after being driven from the nest bush three times, was no longer molested.

In a few moments I moved within a short distance of the nest bush and observed the jay eating from the nest before it flew away. Upon examining the nest two eggs were seen, one of which was partly eaten. I then withdrew about ten feet and observed the actions of the towhees upon their return to the nest. One of the towhees arrived and nervously hopped around in the surrounding shrubs before moving up near the nest, where it gave a few faint "*tsip*"s. It then went to the nest and removed the broken egg in two trips. The last time, as it hopped to the rim of the nest, it sang a high-pitched, warbled song not unlike that of a House Finch, but so faint that I could barely hear it. I could see the bird making singing movements with its bill and throat, and I checked the surrounding bushes to be sure no other birds were present. The bird then sat on the nest, which now contained but one egg. Meanwhile the other bird of the pair was chipping nearby and occasionally uttering a wheezy note that I had heard commonly during the preceding week, and which Quaintance (Condor, 43, 1941:152-155) has called the "mate call." The next day the birds were not heard in the yard and a check of the nest on the following day showed the other egg to be missing and the nest deserted. The towhees were also missing, and they have not been seen in their territory to this date.

A summary of the notes and songs used on this occasion is as follows: a *chip* used commonly and varied with excitement of territorial and nest defenses, a thin *tsip* on approaching the nest, the mate-call, a harsh distress note uttered during the attack on the jays, and a high-pitched, warbled note by a bird on the rim of the nest, resembling the song of a House Finch. These last two are in addition to those reported by Quaintance (*op. cit.* and Condor, 40, 1938:97-101).—HENRY E. CHILDS, JR., *University of California, Berkeley, California, June 16, 1948.*

The Cowbird Moves Northward in California.—Until recent years the humid coast belt of northern California has been free of the Cowbird (*Molothrus ater*). The writer had never expected that this parasite would reach the dense groves of fir and redwood in Humboldt County. However, sufficient data from Humboldt County have now accumulated to warrant listing the Cowbird as at least a casual summer visitor in this section. Observations on six nests each containing an egg of the Cowbird and sight of a pair at close range seem to indicate that this species is more common than thought even though it still is more or less localized. It occurs on suitable open river bars, avoiding the heavy timber.

Two Cowbird eggs were noted in June of 1941, on the Eel River Bar, in the vicinity of Fernbridge, Humboldt County, California. One was in the nest of either a Pileolated Warbler (*Wilsonia pusilla*) or an Orange-crowned Warbler (*Vermivora celata*). The single egg was in the nest and no other eggs were present. The other egg was found in the nest of a Western Flycatcher (*Empidonax difficilis*), which contained one egg of the flycatcher as well. These two eggs could well have been deposited by the same female. A third Cowbird egg was noted that same year in June on the Van Duzen River Bar at Alton, Humboldt County, California.

Observations were discontinued during the war years, but in June of 1947 another Cowbird egg

was found in the nest of a Song Sparrow (*Melospiza melodia*) at Shaws Crossing on the Mad River Bar, Humboldt County, California. This nest contained three eggs of the sparrow and one of the Cowbird.

In June of 1948 the writer finally observed a pair of Cowbirds. The birds were feeding on a lawn at Hoopa, Humboldt County. Both male and female were feeding with a small flock of Brewer Blackbirds. A Chipping Sparrow (*Spizella passerina*) nest was located nearby which contained one egg of the Cowbird and one of the sparrow.

On the Eel River Bar at Miranda, Humboldt County, California, another egg was noted during the last of June. This egg was found in the nest of a Yellow Warbler (*Dendroica aestiva*), from which the three rightful eggs had been tossed to the ground.

As no specimens have been collected, the subspecies concerned is not certainly known, but *Molothrus ater obscurus* has been taken at Hyampom, Trinity County, California. All of the localities in Humboldt County are west of this station and both the Mad River and Hoopa sites are farther north as well.—Robert R. Talmadge, *Eureka, California, July 7, 1948.*

Notes on Actions of the Audubon Caracara.—On March 11, 1947, my brother and I were camped about one mile south of the watering stop of Piedra, 22 miles southeast of Guaymas, Sonora. Here we observed an Audubon Caracara stalking along the railroad track about 100 feet away. Presently it came down the bank to the edge of a small grassy opening where another adult caracara was standing near the base of a small clump of mesquite. The two faced each other about one foot apart when suddenly the first caracara threw back its head until the tip of the black crest feathers rested on its back. While in this strange position, with throat feathers fluffed out, it uttered a peculiar sound which I recorded as *cre-a-ak—croa-ak—crea-ak*. Within a minute, as we watched less than fifty feet away, the same performance was repeated. It was probably some sort of a mating call. The other adult, possibly a female, stood still during these performances.

Later the caracara which gave this exhibition walked to a log about two feet in length and three or four inches in diameter. It seized the wood with its feet, gave a tug, and easily pulled it out of the way. Then it stepped forward to where the log had lain and started searching for insects. Not finding any, it scratched like a hen for a few seconds and examined the scratchings for what they might contain. Again finding nothing, it once more scratched and searched without results and then stalked back to where the other caracara was stationed. The two then ambled off and were soon lost to view in the mesquite brush.—Ernest R. Tinkham, *Tucson, Arizona, April 20, 1948.*

Black Swift Nesting in Southern California.—On July 4, 1948, I found a Black Swift (*Nephoecetes niger*) nesting at an elevation of approximately 3000 feet near Hemet in Riverside County, California. The nest site was typical for this species: under a waterfall in a moss-filled grotto and concealed by ferns and other hanging aquatic plants. The nest was a well-rounded, high-lipped cup made completely of growing moss and placed only a few inches from the running water about four feet above the surface of a large pool. The single white egg was heavily incubated.

The bird which was incubating at the time of discovery sat very closely and did not flush until almost touched. The bird left the nest without a sound and flew straight down the canyon and out of sight. We continued our trip up the canyon and on our return late in the afternoon, the nest was again approached and this time the bird was closely observed upon the nest.—Edward M. Hall, *Whittier, California, July 17, 1948.*

Bird Records from Northeastern Montana.—I spent most of the summer of 1943 at the Medicine Lake National Wildlife Refuge in Sheridan County, Montana, studying bird populations and environmental conditions before and during an outbreak of botulism. Several observations there and westward to Phillips County added to the records in Aretas A. Saunders' "A Distributional List of the Birds of Montana" (Pac. Coast Avif. No. 14, 1921). The distribution file and collection of the Fish and Wildlife Service of the U. S. Department of the Interior also aided in the evaluation of the observations and furnished several additional records.

Nycticorax nycticorax. Black-crowned Night Heron. In Saunders' Hypothetical List, page 173. The Fish and Wildlife Service has records of its occurrence at Albion, Fallon County, May 9 and 12, 1939, on the authority of Mrs. J. E. Butcher; and at Medicine Lake National Wildlife Refuge, in 1941,

on the authority of T. C. Horn. I saw from 1 to 20 at several localities on the Medicine Lake Refuge during July and August, 1943, and 4 at the Bowdoin National Wildlife Refuge, Phillips County, on August 19, 1943.

Coturnicops noveboracensis. Yellow Rail. Not recorded by Saunders. On July 24, 1943, I followed one bird for an hour or more at close range in a dense three-square-arrow-grass marsh on the Medicine Lake Refuge. In one short flight it appeared to be about as large and dark as a sora and to have a long white stripe on the back edge of its wing. I heard one in the same place on July 27. As described in Peterson (A Field Guide to Western Birds, 1941:52), its call consisted of ticking notes that alternated in groups of two and three. The middle note of each group of three was strongly accented. The habitat, behavior, and call were about as described by R. Fryer (Canadian Field Naturalist, 51, 1937:41) and Thomas S. Roberts (The Birds of Minnesota, Vol. 1, 1946:449).

Charadrius hiaticula. Semipalmated Plover. Not recorded by Saunders. Winton Weydemeyer first recorded this species at Fortine, Lincoln County, Montana, September 2, 1928 (Auk, 47, 1930:98). I saw from 1 to 6 at several localities on the Medicine Lake Refuge during July and August, 1943.

Arenaria interpres. Ruddy Turnstone. Not recorded by Saunders. The Refuge files reported its occurrence at the Medicine Lake Refuge on July 9, 1941. I saw 2 on the Refuge on July 31, 1943.

Calidris canutus. Knot. Recorded once by Saunders, page 171. I saw one on the Medicine Lake Refuge on July 20, 1943, and two in the same place on July 24. Both were in spring plumage.

Cistothorus platensis. Short-billed Marsh Wren. In Saunders' Hypothetical List, page 175. I saw one on the Medicine Lake Refuge on July 30, 1943; heard one in another locality on the Refuge on July 30; and heard one again on August 10.

Spiza americana. Dickcissel. Not recorded by Saunders. Chas. F. Hedges first recorded this species from the vicinity of Miles City, Custer County, in 1921 and 1922 (Condor, 26, 1924:228-229). I found it fairly common at several places in the Missouri Valley in July, 1943, as follows: 2 just south of Glasgow, Valley County, on July 10; 2 four miles west of Poplar, Roosevelt County, on July 10; 1 six miles west of Brockton, 1 five miles west of Brockton, and 1 four miles west of Brockton, all in Roosevelt County, on July 10; 1 on the Medicine Lake Refuge on July 14; and 2 at Medicine Lake village, Sheridan County, on July 17. L. B. Potter recorded the dickcissel from Eastend, Saskatchewan, on June 16, 1940 (Canadian Field Naturalist, 57, 1943:71).

Passerherbulus caudacutus. Leconte Sparrow. In Saunders' Hypothetical List, page 175. The Fish and Wildlife Service has a record of one seen at Johnson Lake, Roosevelt County, on June 6, 1910, by E. A. Preble and H. E. Anthony. An immature male was collected at Lake Bowdoin, Phillips County, on October 3, 1915, by Alexander Wetmore (No. 3077). The specimen is now in the Fish and Wildlife Service Collection in the National Museum (Catalogue No. 261492). Its identity has been confirmed by Dr. John W. Aldrich. I saw one and heard its characteristic song on the Medicine Lake Refuge on August 6, 1943.

Ammospiza caudacuta nelsoni. Nelson Sharp-tailed Sparrow. Not recorded by Saunders. A male was collected at Johnson Lake, Roosevelt County, on June 6, 1910, by H. E. Anthony (No. 104). The specimen is now in the Fish and Wildlife Service Collection in the National Museum (Catalogue No. 228632). Its identity has been confirmed by Dr. John W. Aldrich. I saw from one to several at various localities on the Medicine Lake Refuge from July to September 1943.—NEIL HOTCHKISS, *Fish and Wildlife Service, Laurel, Maryland, May 21, 1948.*

NOTES AND NEWS

Fig. 56. H. W. Carriger, member of the Club since June 5, 1895.

The color portrait of a Saw-whet Owl (*Aegolius acadicus*) by Allan Brooks, which appears as the frontispiece in this issue, is based on a juvenal female collected on July 19, 1942, at Okanagan Landing, British Columbia. Original notes by Brooks on color of soft parts are as follows: eye, cadmium yellow; bill and cere, blackish; soles, yellow; claws, black. The stomach contained the remains of an adult robin.

Results of elections at the annual meeting of the American Ornithologists' Union held at Omaha, Nebraska, on October 11-15, 1948, are as follows: president, R. C. Murphy; vice-presidents, J. Van Tyne and A. H. Miller; secretary, O. S. Pettingill, Jr.; treasurer and business manager, A. D. Moser; council members, A. L. Rand, A. J. van Rossem, and J. T. Zimmer for 3-year terms, and F. C. Lincoln for a 2-year term; new fellows, O. L. Austin, Jr., T. D. Burleigh, J. C. Greenway, Jr., R. T. Peterson, and F. A. Pitelka; new members, M. Broun, A. J. Duvall, A. I. Good, C. O. Handley, Sr., G. E. Hudson, J. T. Marshall, Jr., C. K. Nichols, M. M. Peet, W. H. Phelps, Jr., J. McB. Robertson, J. O. Stevenson, R. W. Storer, A. Stupka, W. Taber, and R. E. Yeatter. The Brewster Medal was awarded to David Lack in recognition of his work on the Galapagos finches.

With the advent of the Starling (*Sturnus vulgaris*) in the West, it would now seem possible to make observations that would throw light on the question of how certain species of birds acquire imitations of other species. I discussed this subject some years ago (Condor, 25, 1923:68-69).

Soon after the Starling arrived in America it began to imitate the songs of American birds. Some of those imitations, particularly that of the Eastern Wood Pewee (*Contopus virens*), are used so commonly that the call was suspected to be a natural one for the Starling, coincidentally similar to that of the pewee. Observers who know the Starling in Europe, however, state that that is not the case.

Does each individual Starling acquire imitations by hearing the bird it imitates, or by hearing its parents' imitations? If there are observers in the western states who are familiar with the song of the Eastern Wood Pewee, perhaps they will be able to tell us whether the Starlings there continue to use that call, and also how soon they begin to imitate species that are strictly western. —Aretas A. Saunders.

PUBLICATIONS REVIEWED

In the past few months a number of important ornithological publications have been received at the editorial office; availability of these works should be generally known. The first three of these are continuations of much-used series.

CHECK-LIST OF BIRDS OF THE WORLD. VOLUME 6. By James L. Peters. Harvard University Press, Cambridge, vii+259 pp., October, 1948. This carries Peters' great compilation through the Piciformes. Future volumes will take up the Passeriformes.

CATALOGUE OF BIRDS OF THE AMERICAS. PART I, NUMBER 2. By Charles E. Hellmayr and Boardman Conover. Field Mus. Nat. Hist., Zool. Ser., 13 (pt. 1, no. 2): vii+434 pp., August 18, 1948. This section covers the Spheniscifformes through the Anseriformes of Wetmore's classification.

LIFE HISTORIES OF NORTH AMERICAN NUTHATCHES, WRENS, THRASHERS, AND THEIR ALLIES. By Arthur Cleveland Bent. U. S. Nat. Mus. Bull. 195:xi+475 pp., 90 pls., received July 20, 1948. A further valuable segment of the Bent "Life Histories."

BIRDS OVER AMERICA. By Roger Tory Peterson. Dodd, Mead and Company, New York, xiii+342 pp., 105 ills., October 4, 1948. An informal narrative of ornithology addressed to the amateur and designed to give him a broader understanding of himself and the birds to which he is attracted. Peterson's style captures and holds the interest of the reader. In a very simple fashion the book registers a great amount of information and sound interpretation. One should not be misled by the vagueness and mediocrity of the title.

TERRITORY IN BIRD LIFE. By Eliot Howard. Collins, London, 224 pp., 11 pls., 2 figs., August 9, 1948. A republication of Howard's original book of 1920, which classic work has long been unavailable.

THE BIRDS OF KOREA. By Oliver L. Austin, Jr. Bull. Mus. Comp. Zool., 101:301 pp., 1 pl., June, 1948. A valued compilation of distributional and taxonomic information. Considerable miscellaneous natural history is incorporated.

COOPER CLUB MEETINGS

SOUTHERN DIVISION

MAY.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held May 25, 1948, in Room 145 Allan Hancock Hall, University of Southern California. The resolution to elect Dr. Louis B. Bishop to Honorary Membership in the Club was unanimously passed. The following names were proposed for membership: Mrs. Perrine Moncrieff, "The Cliffs," Nelson, New Zealand, Thomas H. McAllister, Jr., 3453 N.E. Hassalo St., Portland 13, Oregon, Harold F. Wing, 7165 Bunkerhill Rd., Jackson, Michigan, Hatch Graham, Jr., 10300 Viretta Lane, Los Angeles 24, Calif., and Brother Pius, F.S.C., Brothers of the Christian Schools, Napa, Calif., by C. V. Duff; Mrs. Dorothy Hobson, 1309 No. Pennsylvania St., Apt. 39, Indianapolis 2, Indiana, by Harold Michener; and Max Meinhardt, 2317½ Twenty-first St., Sacramento 14, Calif., by W. Lee Chambers. [Proposals for membership presented at the Annual Meeting at Pacific Grove in May, but not heretofore recorded on these pages were: Andrew Dawson Blalock, 24 El Verano Rd., Orinda, Calif., by Eric C. Kinsey, and Waldemar L. Wiederhoeft, 327 Butterfield Rd., San Anselmo, Calif., by Jean M. Linsdale.]

Kenneth Stager and other members reported on events which took place at the annual meeting of the Club held at Pacific Grove, May 7-9.

At the close of the meeting, Mr. Stager reminded the group of the forthcoming opening of the new Bird Hall at the Los Angeles County Museum on May 27, an event long anticipated by bird students of the vicinity.—HILDEGARDE HOWARD, *Secretary pro tem.*

NORTHERN DIVISION

SEPTEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, September 23, 1948, in Room 2503 Life Sciences Building, University of California, Berkeley. Proposals for membership were read as follows: Robert Keith Selander, 366 West 2nd North, Salt Lake City, Utah, by W. H. Behle; Lt. Herman Kitchen, Jr., 9th Infantry, Fort Lewis, Washington, by F. A. Pitelka; Miss Florence Morrow, P.O. Box 944, Carmel, California, by Laidlaw Williams; Neil Hotchkiss, 5704 41st Ave., Hyattsville, Maryland, and Robert I. Bowman, International House, Berkeley, California, by Alden H. Miller; Richard Henry Schaefer, 1930 Warren St., Davenport, Iowa, and Robert Herbert Hansman, 1215 Avenue F, Fort Madison, Iowa, by R. W. Storer.

Henry Childs reported a Nuttall Woodpecker and an immature Red-breasted Nuthatch in Berkeley on July 18. Mr. Kinsey again trapped a Tennessee Warbler in Marin County during the fall migration.

Dr. Robert T. Orr presented an illustrated talk on the birds of the mountains of northeastern Idaho.—CHARLES G. SIBLEY, *Secretary.*

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December 1, 1948

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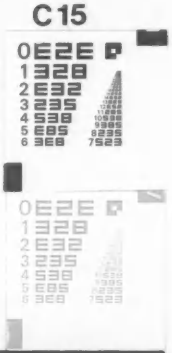
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